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Technical faculty "Mihajlo Pupin"
Zrenjanin



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ON APPLIED INTERNET AND
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TECHNICAL FACULTY "MIHAJLO PUPIN"
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INTRODUCTION

Information Technologies and Internet as a part of Computer science creates new approaches and perspectives, new models and numerous services, which opens up and makes use of the world of information and symbolized knowledge. Advances in Information technology, including the Internet, have dramatically changed the way we collect and use public, business and personal information.

The 1st **International Conference on Applied Internet and Information Technologies** is an international refereed conference dedicated to the advancement of the theory and practical implementation of both knowledge of Information Technologies and Internet and knowledge of the special area of their application.

The objectives of the **International conference on Applied Internet and Information Technologies** are aligned with the goal of regional economic development. The conference focus is to facilitate implementation of Internet and Information Technologies in all areas of human activities. The conference provides forum for discussion and exchange of experiences between people from government, state agencies, universities and research institutions, and practitioners from industry.

The key Conference topic covers a broad range of different related issues from a technical and methodological point of view, and deals with the analysis, the design and realization of information systems as well as their adjustment to the respective operating conditions. This includes software, its creation and applications, organizational structures and hardware, different system security aspects to protocol and application specific problems. The Conference Topics are:

- Information systems
- E-commerce
- Internet marketing
- Computer networks and data communications
- ICT Support for decision-making
- Embedded systems and robotics
- Customer Relationship Management
- Data and system security
- Software engineering and applications
- Reliability and maintenance
- Business intelligence
- Process assessment and improvement
- ICT practice and experience

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President of the Organizing Committee
Ph.D Borislav Odadžić

Zrenjanin, October 2012

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INVITED PAPERS

Managing Critical Infrastructure for Sustainable Development in the Telecommunications Sector in the Republic of Serbia

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Abstract - In last decades countries worldwide persisted in their efforts to foster competition in telecommunication/ICT markets. All regulatory focuses were directed to ensure competition and to regulation of the ICT market. More recently, electronic content, cyber security, data protection, privacy and environmental issues have entered into the scope of regulatory activities. In parallel on the global and national level discussion on Critical Telecom Network Infrastructure - CTI resulted in Strategies for CTI. This paper deals with basics of critical infrastructure, addressing definitions and standards with a highlight on the telecom sector. In the paper some situations in the region and Serbia and potential future steps are presented in order to initiate discussion on the need for regulation of Critical Telecom Network Infrastructure - CTI in Serbia.

I. INTRODUCTION

In last decades countries worldwide persisted in their efforts to foster competition in telecommunication/ICT markets. All regulatory focuses were directed to ensure competition and to regulation of the ICT market. More recently, electronic content, cyber security, data protection, privacy and environmental issues have entered into the scope of regulatory activities.

Analyzing ICT sector, the data from 2011 have shown that the ICT sector continued to grow rapidly, with the exception of fixed telephony, where penetration rates have been on the decline since 2005. Many predictions are available giving the answers on what is the next in sector development. Venture Partners in their prediction made 2009-2010, shown in Fig. 1, presented their view on four dimensions of ICT development till 2025, e.g. Networks, Wireless, Content/Applications and Devices.

As Fig. 1 illustrates the increased use of online applications and services to communicate and do business (such as social media, cloud services, e-payment and other m-banking services) bring a host of new regulatory issues to the fore, for all ICT stakeholders. Many papers deal with security and privacy of data [1] and many problems in this respect are solved out by service providers. Therefore, these issues, in spite that are closely related to Critical Telecommunication Network Infrastructure - CTI are not in the scope of this paper and the paper discusses infrastructural problems.

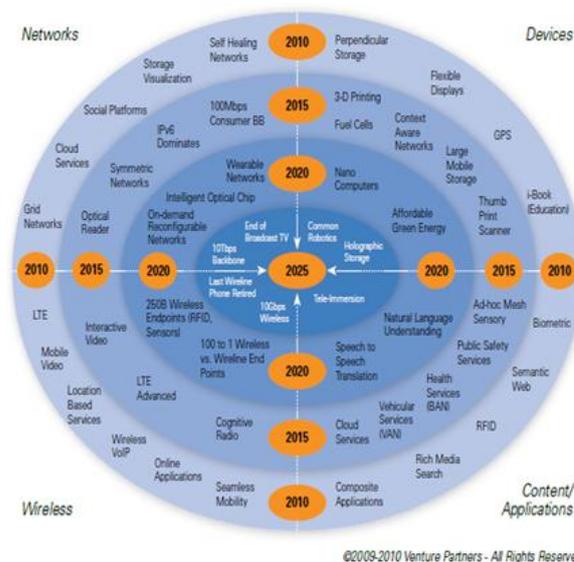


Fig. 1 The 21st century Ecosystem

Worldwide, telecommunication networks are considered as an inseparable part of social interaction and protecting these networks from malicious attacks and natural disasters that could lead to the unavailability or loss of integrity and confidentiality of network services is thus an important aspect that cannot be ignored. It should be highlighted that e-infrastructures, composed of e-communication networks, distributed computing, middleware, software and applications, play an essential role in the advancement of knowledge and technology. Due to their ability to assemble a “critical mass” of people and investment, they contribute to all levels of society’ and economy’s development. They are therefore important assets which should be protected at any side and should be considered as a part of national critical infrastructure. In this paper we try to open questions on is it necessary to regulate CTI and if yes in what extend it should be regulated. For this reason, we started from definition of critical infrastructure and relationship between different critical infrastructures. In brief we list the general standards for critical infrastructure and specific standards for critical telecom infrastructure.

II. WHAT IS CRITICAL INFRASTRUCTURE?

There are many definitions of the Critical Infrastructure - CI, but all of them in principle refer to assets which are essential to the economy and society. Some of these definitions for different region and countries (USA, Australia) are listed below.

USA: “Critical infrastructure and key resources (CIKR) refer to a broad array of assets which are essential to the everyday functionality of social, economic, political and cultural systems in the United States. The interruption of CIKR poses significant threats to the continuity of these systems and can result in property damage, human casualties and significant economic losses. In recent years, efforts to both identify and mitigate systemic vulnerabilities through federal, state, local and private infrastructure protection plans have improved the readiness of the United States for disruptive events and terrorist threats. However, strategies that focus on worst-case vulnerability reduction, while potentially effective, do not necessarily ensure the best allocation of protective resources. This vulnerability conundrum presents a significant challenge to advanced disaster planning efforts. The purpose of this paper is to highlight the conundrum in the context of CIKR” [2].

Australia: “Critical Infrastructure are those physical facilities, supply chains, information technology and communication networks, which, if destroyed or rendered unavailable for an extended period, would significantly impact on the social or economic well-being of the nation, or affect Australia’s ability to conduct national defense and ensure national security” [3].

The CI is a subject within EU regulation. In the EU Council directive 2008/114/EC following terminology is used:

(a) “Critical infrastructure means an asset, system or part thereof located in the Member States which is essential for the maintenance of vital societal functions, health, safety, security, economic or social well-being of people, and the disruption or destruction of which would have significant impact in a Member State as a result of the failure to maintain those functions”.

(b) ‘European critical infrastructure’ or ‘ECI’ means critical infrastructure located in the Member States the disruption or destruction of which would have a significant impact on at least two Member States. The significance of the impact shall be assessed in terms of cross-cutting criteria. This includes effects resulting from cross-sector dependencies on other types of infrastructure. [11]; List of European CI is given in Annex I of [11] and shown in Table 1.

This Directive constitutes a first step in a step-by-step approach to identify and designate ECIs and assess the need to improve their protection. As such, this Directive concentrates on the energy and transport sectors and should be reviewed with a view to assessing its impact and the need to include other sectors within its scope, inter

alia, the information and communication technology (‘ICT’) sector.

Sector	Subsector	
I Energy	1. Electricity	Infrastructures and facilities for generation and transmission of electricity
	2. Oil	Oil production, refining, treatment
	3. Gas	Gas production, refining, treatment
II Transport	4. Road transport 5. Rail transport 6. Air transport 7. Inland waterways transport 8. Ocean and short-sea shipping and ports	

Table 1. EU critical infrastructure sectors

Member States identification of critical infrastructures which may be designated as ECIs is undertaken pursuant to Article 3. Therefore the list of ECI sectors in itself does not generate a generic obligation to designate an ECI in each sector. According to the Article 3 of DIRECTIVE 2008/114/EC, under the point 3, priority to be included in the ECI is given to the ICT sector: A review of this Directive started on 12 January 2012.

Based on literature review, the main elements of national CI could be identified as:

- Information & Communications (telecom, networks, Internet)
- Electric Power (conventional, nuclear)
- Transportation
- Oil & Gas (supply, transport, refining, distribution)
- Banking and Finance
- Water & Emergency Services
- Government (+military).

The critical infrastructures within the county are a complex “system of systems.” Interdependencies are generally not well understood and disruptions in one infrastructure can propagate into other infrastructures. Between those CIs interdependencies is very strong. Critical infrastructures interact at different levels, and failure in one infrastructure may impact the functionality of other infrastructures. The significant importance of these infrastructures over the society and their interferences means that sufficient safety and security measures should be identified to reduce the risks of failure [4]. The Fig. 2 illustrates the interdependency between some CI.

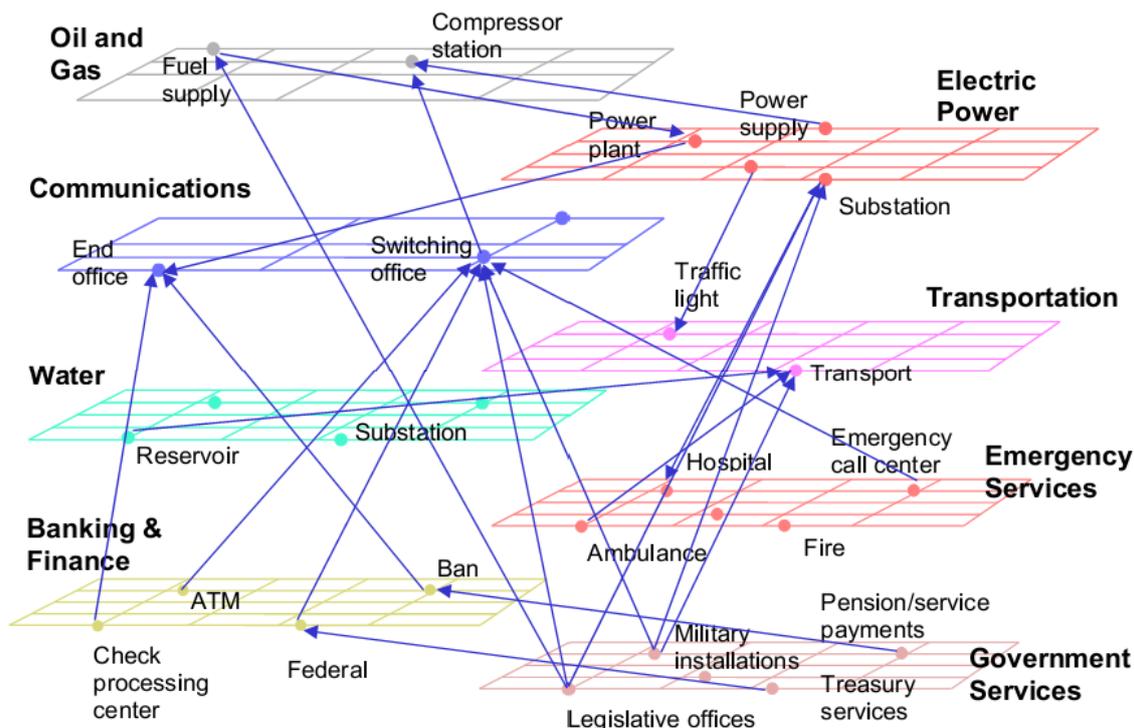


Fig. 2 Interdependency between different sectors [5]

It is clear from the Fig. 2 that there is a great deal of interdependency between the Telecommunication Sector and a number of the functionalities within the utility community. Almost all of the utilities have critical requirements for communications of any form. Alternatively, the communications community has a number of instances where they are dependent on the utilities, what leads to the conclusion that communications is a key infrastructure, central to all others, so that understanding and modeling the risk due to communications disruptions is a high priority in order to enhance public safety and infrastructure resiliency [6].

Within the ITU's family, Critical national telecommunication infrastructure has not been explicitly defined. However, many references to the protection of critical national infrastructure exist especially in the context of security of telecommunications/ICT networks and services (PP-10 Res. 130, PP-10 Res. 174, ITU CS/Art.38, ITU CS/Art.34, ITU CS/Art.35) and several workshops on this issue were held.

Using above mentioned definitions we can say, in general, that CTI is very often dependent on the context in which it is used and on the overall country approach to the CI. A CTI can be identified as a public or private network that carries information relevant to national security and safety or information of high financial value. CTI can also be defined physically as the whole network or a part of the network that exchanges information of high significance. The clear strategy for management of CTI would help operators and society and economy identifying critical infrastructures and critical resources and the impact of the failure to other sectors and their CI.

Many of the country's broadband policies and plans focus on building nationwide broadband infrastructure,

stimulating demand through the adoption of online services and applications, and extending connectivity to provide universal access and this infrastructure could be considered as CTNI. From the other hand, some authors refer that if the objective of the network itself is to exchange confidential information among nations, the whole network itself can be defined as a CTI [7].

III. IMPACT OF THE FAILURE OF COMMUNICATIONS SECTOR SYSTEMS

The impact of the failure of the Communication sector is subject of many studies, in which assessment of the overall risk is evaluated. For risk management different methodologies could be used. One of the ways for risk assessment is illustrated in Fig. 3, which plots the risk profiles for potential disruptions in the telecom sector.

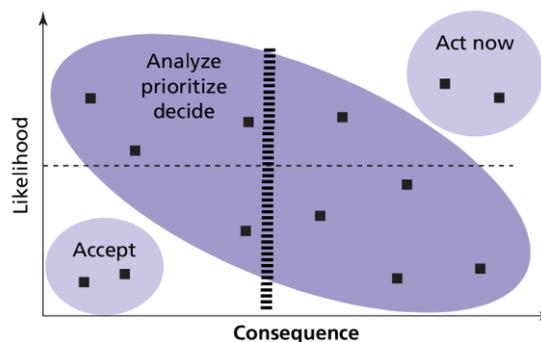


Fig. 3 Risk profile for potential disruption in communication sector [8]

When the risk is low (lower left corner), the event is unlikely to happen, and if it does, the consequence of the event is relatively low. Therefore, the most appropriate course may be to simply accept the risk, and live with the consequences. However, when risk is high (upper right corner), we should act immediately to reduce that risk as much as we are able to. When risk is in the broad middle area, then it is especially important to analyze and prioritize before decisions can be made. All of these analyses should be used to identify critical resources and critical telecom network infrastructure. Furthermore, risk-informed decisions are needed, not only for network protection, but to help identify investment strategies and other options that best reduce overall risk.

As an example of dependencies among telecom and other infrastructures, we can observe communications, power, and emergency services and the potential cascading effects among them as shown in Fig. 4.

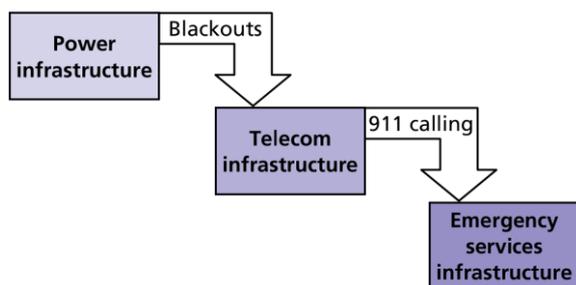


Fig. 4 Example cascading of impacts across industries: power, telecom, and emergency services [8]

In general, cascading across infrastructures can occur in almost any order, but telecommunications have been always a central component surrounding the disruption and is especially important in mitigating the disruptive effects.

IV. STANDARDIZATION FRAMEWORK ON CRITICAL INFRASTRUCTURE

Critical infrastructure management is directly dependent on risk management processes. Which infrastructural element will be considered an element of national critical infrastructure depends on decisions of the risk management team. Accordingly, discoursing of critical infrastructure models is an inseparable process from setting up risk management steps related to infrastructure.

Global standardization framework

Global standardization framework on risk management is defined in the ISO 3100 Standard [9].

Elements of risk management process are defined using family of standards relating to risk management codified by the International Organization for Standardization, ISO 31000. They are divided into several groups: Establish the context, Identify risk, Analyze risk, Evaluate the risk, Treat risk, and two groups of processes that are conducting simultaneously with the prior: Monitor

& Review and Communicate & Consult. Starting from international standard ISO 31000, methodologies for risk management could be derived.

Within USA Homeland Security document which represents an annex to the National Infrastructure Protection Plan, framework for risk management in the telecom sector is developed (Schaffer, et al., 2010). Elements of this plan are extracted so they completely correspond to protection of telecommunication infrastructure problem. They are actually adjusted elements, derived from International Standard ISO 31000.

CTI related standards

As we have said previously, specific standard for CTI has not been explicitly defined, However, there are numerous security standards and specifications designed for telecom operators by international standard organizations (ISO/IEC, 3GPP, 3GPP2, ITU-T), see Table 2, which could be used in defining strategies for CTI.

Org.	Standard/ Specifications	Description
ISO/IEC	27001:2005 27002:2005 27011:2008	Specifies requirements for an Information Security Management System, a code of practice for information security management and a standard applicable to telecommunications organizations
3GPP, 3GPP2	33-Series, S.S0086 and others	Provides specifications for security standards for GSM, W-CDMA and LTE
3GPP2	S.S0086 and others	Provides specifications for security standards for GSM (including GPRS and EDGE), W-CDMA and LTE (including advanced L TE) mobile systems
ITU- T	E.408-409 X.805, X.1051	Security requirements, threat identification frameworks and guidelines for risk mitigation, Incident organization, Security architecture for systems providing end-to-end communications

Table 2. Security standards for telecom operators [4]

V. SITUATION IN THE REGION AND SERBIA

Many countries worldwide has identified their CTI and related bodies responsible for CTI (USA, Canada, Germany, Sweden, Norway). Several countries have started projects on CTI (Brazil). Considering the situation in our region, we can say that CTI issues are not very often discussed [10].

Recessionary conditions in the region contribute to this situation. If CTI is mentioned then it is within general regulation on CI.

In **Slovenia**, regulation of CTI is within the Directive on European critical infrastructure [11].

As far as, in **Republic of Croatia** for critical infrastructure no legal framework is in place, but

ministries in charges has established the special interdepartmental working group. The basis for their work is the Council Directive 2008/114/EC. Within Hrvatska elektroprivreda (Croatian Power Utility Company) the project on CI is prepared.

In **Bosnia & Herzegovina** Computer Emergency Response/Readiness Team-CERT is established in order to prevent, support and react on computer's attacks on information and automated systems, which are critical infrastructure. In this sense critical infrastructure comprises all systems affecting functioning and quality of society such as railroad signalization systems, power distribution, government systems and telecommunications and information systems.

In **Montenegro**, also, National Computer incident response team-CIRT is established to be the focal point for coordination and data exchange, protection against cyber attacks and recovery after cyber attacks. All governmental bodies and national critical infrastructure are its users.

In **Serbia**, National Strategy for an Information Society in Serbia 2020, deals with the protection of critical infrastructure in chapter 6.2 in relation to information security, attacks using ICT and ways of protection [12]. In this document the need for defining criteria for identification of critical infrastructure is required. National strategy for protection and rescue in emergency situations and Law on Emergency Situations [13] has not referred to CTI. Within the Project "Managing critical infrastructure for sustainable development in the postal, railway and communications sector in the Republic of Serbia" (Project No. 036 022) CI for three mentioned sectors is discussed. The main Project's objective is to identify critical infrastructure systems, whose efficiency and effectiveness is essential for the smooth growth and development of economy and society. The part of the Project is dealing with CTI and is carried out by the project team from Transport and Traffic Engineering Faculty team and Telecom Serbia. Having in mind all factors that can attack telecom infrastructure (natural disasters, targeted attacks, some unintentional disturbance) and different ownership on telecom infrastructures (public and private), the issues about CTI become regulatory issues [14]. The National backbone network is under discussion and CTI, its regulation and operator's obligations should not be neglected in those discussions.

EU Council Directive 2008/114/EC is a basis for the next steps in defining criteria for CI. In its Annex III procedure which shall be implemented by each Member State goes through the following series of consecutive steps [11]:

Step 1 - Each Member State shall apply the sectoral criteria in order to make a first selection of critical infrastructures within a sector;

Step 2 - Each Member State shall apply the definition of critical infrastructure pursuant to Article 2(a) to the potential ECI identified under step 1. For infrastructure providing an essential service, the availability of alternatives, and the duration of disruption/recovery will be taken into account;

Step 3 - Each Member State shall apply the transboundary element of the definition of ECI pursuant to Article 2(b) to the potential ECI that has passed the first two steps of this procedure. A potential ECI which does satisfy the definition will follow the next step of the procedure. For infrastructure providing an essential service, the availability of alternatives, and the duration of disruption/recovery will be taken into account; *Step 4* - Each Member State shall apply the cross-cutting criteria to the remaining potential ECIs. The cross-cutting criteria shall take into account: the severity of impact; and, for infrastructure providing an essential service, the availability of alternatives; and the duration of disruption/recovery.

For detailed definition of CTI and critical resources within telecom infrastructure, and for application of fundamental network security features it is necessary to: identify the critical points of telecom infrastructure; to propose recommendations intended to prevent security incidents and to guarantee service and business continuity if they happen; to elaborate strategies and policies to protect telecom infrastructure; and to analyze interdependence among different infrastructures; to propose recommendations intended to prevent security incidents and to guarantee service and business continuity if they happen; to elaborate strategies and policies to protect telecom infrastructure.

VI. CONCLUSION

One of the fundamental condition in regard to CTI is development of a systematic legal approach which ensure that country's CTIs is a part of international CTI. It requires harmonization with the provision of the international institutional organization's framework. Also, awareness-raising regarding the necessity of CTI security is an important part of CTI policy. It should define the obligations of CI organizations in the country to disseminate public information in order to raise awareness of its importance. For Europe, the legal frame for critical infrastructure has been made in EU Council Directive 2008/114/EC. Regarding critical telecommunications infrastructure one initiative of this kind is undertaken by the European Union, which intends to carry out "best practice" promotional campaigns and to encourage members to exchange data with one another. This approach could be applied in the SEE region too.

ACKNOWLEDGMENT

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Energy-Efficiency Study of Power-Aware Software Applications

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Abstract – Smartphone and tablet devices will blow past PC sales in a few years. Therefore in the near future most of today complex PC software solutions will switch to mobile implementations. However, the energy requirements of these software solutions surpass by far the energy storage capacities available with today battery technologies. Furthermore, modern power management mechanisms implemented by low power devices and mobile operating systems cannot support energy requirements of highly computational or communication intensive applications. Therefore, energy saving mechanisms implemented at the higher layers of the system are considered the next important step in the implementation of highly energy-efficient mobile solutions. The study presented by this paper discusses the options available to involve mobile applications in a so called holistic energy management solution.

I. INTRODUCTION

In 2011 something profound has been observed on the ITC market, the smartphone sales overtook PC sales [1]. Following the current trends, the smartphone sales will soon dwarf PC sales (Fig. 1). On the other hand, tablets are still in the early penetration phase. But following the same trends presented by Business Insider (Fig. 1), they will soon reach the number of PC sold. In this context, the future of ITC is certainly going mobile, changing thus the way we interact each other, we are doing business or we entertain ourselves.

Multiple factors contributed to the fast development of mobile devices and applications switch toward mobility:

- The increasing performance of the low power processing units and increasing their number and

type within a single mobile device (multicore CPU, GPU).

- The increasing communication bandwidths and higher transfer rates of the wireless infrastructure together with a diversity of communication interfaces (WiFi, UMTS).
- The increasing capacity and speed of memory and storage.
- The increasing number of sensors and interfaces (GPS, NFC, accelerometer).

These previous factors contributed also to development of various types of new mobile applications like: mobile games, mobile augmented reality, location and context aware services, etc. The new features built in mobile devices and their applications come with an increase of resources usage and energy consumption. The cost that devices have to pay for running such applications is the reduction of the battery lifetime and consequently the devices’ autonomy. Therefore, prolonging the battery lifetime of mobile devices was one of the main research topics in mobile computing during the last decade.

Modern power management mechanisms implemented by mobile devices and operating systems cannot support energy requirements of today highly computational or communication intensive applications. Therefore, energy saving mechanisms involving the higher layers of mobile systems is considered the next important step in the implementation of highly energy-efficient mobile solutions. The study presented by this paper discusses the limitations of today power management strategies and the options available to involve mobile applications in a so called holistic energy management solution.

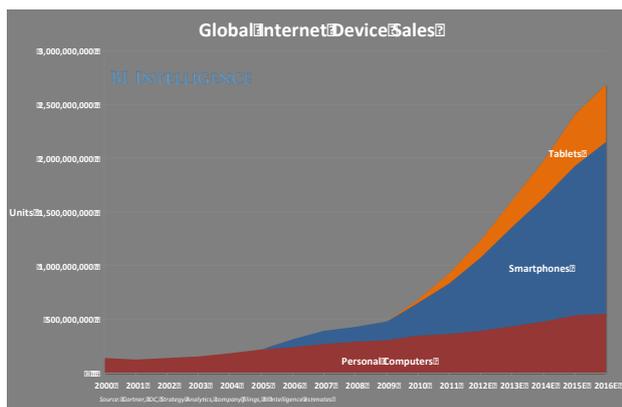


Figure 1 Global units sold of PCs, smartphones and tablets [1]

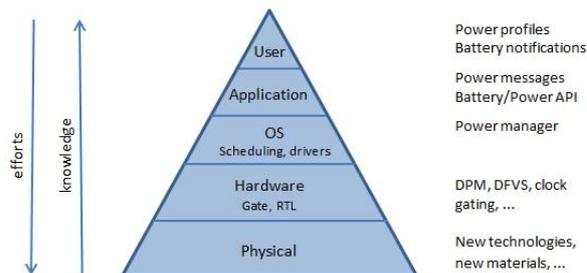


Figure 2 Today power management efforts

II. LIMITS OF LOW-LEVEL POWER MANAGEMENT STRATEGIES

Various power management strategies have been proposed and implemented during the last years in order to reduce the power consumption of the battery powered devices. Power management strategies refer to the set of hardware mechanisms and software algorithms implemented by a computing system to control their power use. These strategies can be implemented at different abstraction layers of a computing system: physical and hardware level, operating system level, application level and user level (Fig. 2). Most of the nowadays efforts are directed to lower layers power saving strategies and higher layers are left behind (Fig. 2).

Power management is a multidisciplinary field that involves many aspects (i.e., energy, temperature, reliability, software), each of which is complex enough to merit a survey of its own. Unfortunately, despite considerable effort to prolong the battery lifetimes of mobile devices, there is no standard efficient solution established for all mobile applications and their hosting devices. This is mainly because the lower layer power management implementations faced their limitation on high-end smart mobile and tablet devices.

These limits are further described for the lower layers power management strategies (Fig. 2):

- Physical layer – at this level we consider the efforts directed toward low power circuits design and new transistor technologies investigated to support low power circuits. In this category we include the transistor level power consumption reduction research effort.
- Hardware layer – at this layer we consider the efforts directed to gate level, register transfer logic and system architecture level power consumption reduction. In this category we include power management mechanism like: DPM (Dynamic Power Management), DVFS (Dynamic Voltage and Frequency Scaling), Clock gating, Power gating, etc.
- Operating system layer – at this layer we consider the efforts directed to operating system and device drivers power management. In this category we include the power management algorithms implemented by OS and device drivers.

The scaling process has been the main factor that drove the development of both high-performance and low-power integrated circuits. By reducing the transistor sizes either increasing performance at the same power consumption or the same performance at the lower power consumption can be achieved. But the limits for the processing frequency are already reached, demonstrated by the current development of multi- and many-cores CPUs. However, continuous technology scaling raises design challenges and concerns due to excessive power consumption [2]. Although switching energy per gate decreases with scaling, the power consumption of the whole device continue to increase due to the leakage current increase and larger number of switching elements [2]. Furthermore, power consumption of mobile devices

must be kept under 3W due to the thermal dissipation problems, thus making power management efficiency even more compelling.

Dynamic power management (DPM) techniques have been proposed and implemented in order to mitigate power consumption increase of the computing systems. The DPM algorithms minimize power consumption by selectively placing the system's unused components in their specific low-power consuming states. The most used DPM algorithms are those based on a time-out strategy. Their disadvantage consists in unnecessary power consumption states during the wait time before entering a low-power consumption state. A second class of DPM algorithms is based on a prediction of system or component behavior for a future time period. In this case, a component will be placed in a low-power consumption state if it is not currently used and the module predicts another longer inactivity period. A false prediction will lead to an increased consumption and also will cause a performance drop. A third class of algorithms is that of random algorithms, which is based on distributions that reflect the component request activation time. These distributions are based on simulations or event monitoring in a system during a given period of time. The main challenge for DPM algorithms is to select the timing and power states for each component of the system. Higher-level applications can provide important knowledge to these algorithms in order to improve their overall efficiency. The knowledge on how available energy has to be used by the system and allocated by DPM algorithms increases from lower layers to upper layers of the system (Fig. 2). For example, a user application is the most able to say how long its tasks or threads will last and thus it can provide valuable information to DPM algorithms implemented by OS. Another example presented in [3] proposes to achieve wireless communication power saving through selectively choosing short periods of time to suspend communication, directly by user applications.

Dynamic Voltage-Frequency Scaling (DVFS), implemented by most available processors, is the most used method for energy consumption reduction while executing tasks with various performance requirements. DVFS saves energy by shifting between several levels of processor voltages and frequencies to execute tasks with the required or expected performance [4]. But, the existing power management mechanisms based on DVFS have several major limitations. The first one is that most of them still focus on the scheduler and rarely explore other opportunities for slack reclamation [4]. The second limitation is that they only use one frequency, from a

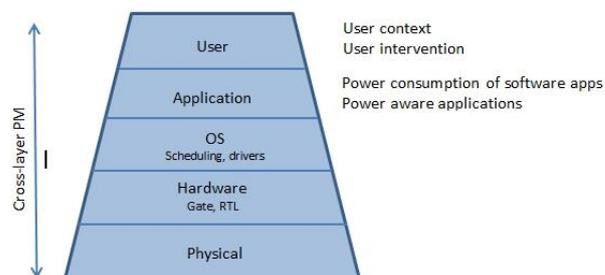


Figure 3 Future trends of power management efforts

discrete set of frequencies, to perform each task [4]. The third limitation is the variety of implementations on multi-core platforms: scaling every core, group of cores of the whole processor. And the last one is the hardware interconnection problems between blocks or cores running at different voltages and frequencies levels. The interconnection implies voltage shifters that introduce latencies and signal degradation. The knowledge available at the higher layers of the system is valuable to increase the efficiency of slack reclamation techniques of processors through efficient use of the generated tasks' slack times by an independent scheduler.

III. STATE OF THE ART OF HIGH-LEVEL POWER MANAGEMENT STRATEGIES

Considering the limitations of lower-level power management strategies, application-level energy efficiency mechanisms are considered the next important step in the evolution of highly power-efficient mobile systems. The final user is also an important element to be introduced within the energy efficiency and management cycle (Fig. 3). However the normal user lacks the basic understanding of the low-level power management mechanisms, even though he is the most able to choose how to consume the remaining energy within the battery. Therefore power management techniques should propagate to higher levels of the system, more specifically to the user applications level (Fig. 3).

Power management mechanisms implemented by today mobile devices provide poor API and services to higher layers of the system (Fig.2). OS usually provide APIs for battery status access and power management. The first API provides user applications with the access to the energy level available in the battery. The second API provides a very limited set of functions and events for user applications to slightly control the power management features of the OS (e.g. prevent display standby activation). Future research directions on application-level power management include measurement and estimation models for energy consumption of software applications and development of energy-aware software applications. Energy consumption models estimate how much energy each application consumes apart from the total energy consumption of the device. The roles of the power-aware application models are first to make the applications aware of their own power consumption and to adapt themselves to reduce consumed power and second to promote and translate system's power management states and actions to the user in a user friendly way. This feature allows higher-level applications to make the users aware of application specific energy consumption aspects and allow users to actively interact with power management mechanisms in a much more effective and informed way.

Furthermore, the accelerated development of the smart devices failed to integrate the user in the decision process concerning the device's power management according to his/hers needs. We believe that it is important for future power management techniques to integrate the user preferences as part of the process. But the user has no capacity to understand and to comprise all aspects and elements of power management as implemented in today operating systems. Therefore power management

techniques should propagate to higher levels of the system, more specifically to the user applications level in a user friendly manner.

During the last years several application-level power management solutions were proposed [5-9]. In [5] an energy-aware framework for dynamic software management of mobile systems was proposed. The authors have designed a user space module, separated of the operating system, which permits the QoS (Quality of Services) based adaptation implemented at the application level. The energy consumption of the mobile applications is computed using predefined software macro-models which are hard to be implemented in practice for different types of applications. Unlike the solution adopted in [5] we estimate online the power consumption of the applications by measuring the battery and system's components parameters. The framework proposed in [5] was validated using three applications: video player, speech recognizer, and voice-over-IP.

In [6] an energy optimization framework for software tasks is proposed. The work is focused on the optimization algorithm based on Markov decision process. The authors propose efficient techniques to solve the optimization problem based on dynamic programming and illustrate how it can be used in the context of realistic applications such as WiFi radio power optimization and email synchronization. Unlike the framework presented in [6] we consider monitoring and providing power consumption feedback to mobile applications.

In [7] a cross-layer framework for power management of mobile devices is presented. The proposed framework involves different layers of a mobile system, from device drivers to user applications. The main goal of the framework is to aggregate the QoS levels of applications and select the optimum component specific power management policies according with the power requirements of the running applications.

In [8] a user-centered energy-aware mobile operating system is presented. The proposed OS manages the hardware resources proactively allowing opportunistic access to external resources nearby. The work presented in [8] follow another approach, using an opportunistic access to computing resources available in nearby devices using local wireless interfaces and information about users' social networks.

The authors of [9] proposed and implemented a design framework called GreenRT, for developing power-aware soft real-time applications. They considered that the task in soft real-time applications must run quickly enough to meet the deadlines, but there is no extra benefit from running them faster than that so that the task finishes earlier. The energy could be saved if tasks are executed with a lower frequency clock in order to meet exactly their deadline, but not earlier than then their deadline. The framework [9] allows an application to monitor its progress and adjusts the processor frequency dynamically to finish its jobs in time. The framework is using the concept of DVFS. However the framework proposed by Chen et al. is not generic, it is highly dependent on the managed application.

IV. ENERGY-AWARE VIDEO PLAYER

The energy-aware test application we implemented based on model proposed in [10] is a video rendering system for a mobile device, which was tested on Pocket PC LOOX T380 Fujitsu Siemens. The proposed application adapts itself dynamically to the energy consumption of the mobile device modifying some parameters, which change some characteristics of the video rendering, to ensure a power usage reduction.

The application was created in three stages: in the first stage the video rendering system was created, in the second stage the influence of some parameters of the system on the device's battery power level was studied and finally in the last stage the obtained results in the energy-aware video player application were applied. The energy adaptation algorithm obtained during the evaluation and calibration tests is further presented. The parameters of the system that were taken into account were: the frame rate, the dimensions of the rendering window and the rendering frequency. For each parameter we selected three adaption levels (Level 1 to Level 3). Each level has specific meaning for the three adaption parameters.

```

WHILE not exit condition
  READ battery status from framework
  IF (battery status <= 60%) AND (battery
status > 50%)
    SET windows size to 0.66 of its
original size
  ELSE IF (battery status <= 50%) AND
(battery status > 40%)
    SET frame drop rate to 1/3
  ELSE IF (battery status <= 40%)
    SET frame display rate to 3
  END IF
END WHILE

```

When the device's battery level reaches the level of 60% from the total energy available when the battery is fully charged the parameter rendering window will be applied and the rendering window will be reduced by 1.5 from its initial dimensions. When the device's battery level reaches 50% the rendering window will be changed back to the initial dimensions and the frame rate will be multiplied by 3. After the device's battery level reaches 40% the parameter that ensures the best energy reduction will be applied, that is the rendering frequency. The frame rate will be established at the initial frame rate of the movie and the rendering frequency will be 3, indicating that only the frames from 3 to 3 seconds will be rendered. The parameter that ensures the best energy reduction is used last because when the battery's energy reaches a low level a better energy reduction is needed to ensure that the device will function a longer time. Power saving results only for software adaption are presented in Fig. 4.

V. CONCLUSION

Modern power management mechanisms implemented by mobile devices and operating systems cannot support energy requirements of today highly computational or communication intensive applications. Therefore, energy saving mechanisms involving the higher layers of mobile

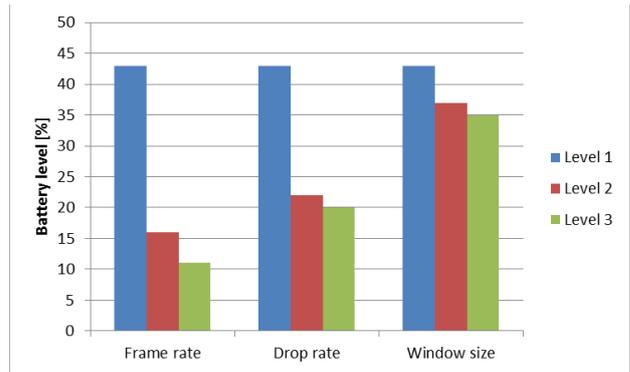


Figure 4 Power reduction of video player adaption

systems is considered the next important step in the implementation of highly energy-efficient mobile solutions. The study presented by this paper discusses the limitations of today power management strategies and the options available to involve mobile applications in a so called holistic energy management solution.

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REGULAR PAPERS

The Elements of Artificial Intelligence in Didactical Software Used for E-learning

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Abstract - The aim of this paper is to simplify and explain the ideas and results of artificial intelligence to educational public in Serbia, especially the concepts of modern knowledge based adaptive intelligent systems enabling individual e-learning. The short review of the results of automatic problems solving theory and automated reasoning, which are important for the development of didactical software, has been presented. The role of knowledge about problem domain has been pointed out as well as the importance of the presentation form related to the knowledge during the process of solution searching. Syntactic and heuristic strategies used for searching solutions have also been discussed. The concept of automated reasoning system has been defined. The conclusion in open world assumption and closed world assumption concepts has also been discussed. The modalities of the usage of automated reasoning system in teaching and learning processes have been adduced too.

I. INTRODUCTION

The predictions that the results of artificial intelligence would be used in education have not been confirmed yet. In the foreword of his monograph 'Problem solving methods in artificial intelligence' [11], which is considered as one of the first books related to this topic, N. Nilson says: As much of the literature related to this issues is very hard to read and understand, I have tried to simplify my language and to give more examples... I would also like to express my gratitude to Professor David Lakhem from Stanford University who tried to teach me mathematical (formal) logic.' These ascertainments, dated back in 1971, have partly explained why these results were so slowly applied in the field of education as well as in some other domain of application. Besides difficulties in understanding complex formalisms and semantic expressions, there are also some other reasons for unexpectedly slow adopting of new concepts.

Therefore, the implementation of artificial intelligence results must be seen as a process that takes place in accordance with the level of mutual compliance of the elements of abovementioned groups. The fact that the current level of application of artificial intelligence in education is not as high as it should be does not reduce the significance of the results achieved, and the potential of this field would cause the inevitable changes in the future, which are based on Internet and distance learning. The following facts could justify these assumptions: Artificial intelligence, as a domain related to intellectual problem solving by automated methods, is not a new concept. It dates back to ancient times (Parmenides, Zenon, Aristotle). Aristotle was the first to define the

formal system and to prove that specific reasoning submit itself to formal laws, while formal rules are independent from concrete content of reasoning.

The application of artificial intelligence results in education can be seen from the two main aspects:

- The effect of the artificial intelligence on didactical-methodical approaches in teaching process lead by teacher where computers are not used in classical teaching process.
- Development and application of intelligent computer programs in appropriate technical environment in e-learning.

This paper deals with didactical software based on knowledge bases and mechanism using this knowledge.

II. DIDACTICAL SOFTWARE IN THE SHAPE OF ADAPTIVE KNOWLEDGE BASED INTELLIGENT SYSTEMS

Multimedia program applications integrating text (hypertext), graphics (pictures), sound (speech, music) and animation (movement) give many opportunities for e-learning and, supplemented with hyperlinks in web applications on Internet, they are the basis for distant learning development. Lately, there has been a tendention to add those applications a term *intelligent*. However, we still do not know the reason for that. Unlike the ordinary multimedia applications, the application of artificial intelligence results is manifested through the development of intelligent tutorial systems, expert-teaching systems, dialogic systems and deductive knowledge base. All these are called knowledge based systems.

Knowledge based systems are intelligent systems, not because they have got knowledge base, but because they have the mechanism for practical usage of that knowledge. It is the inference mechanism, which is based on some of automated reasoning systems (ARS).

Modern intelligent knowledge based systems have one more important characteristic-adaptivity. It enables the system to adapt to individual characteristics of the user, to the extent approved by implemented solutions about user's model.

- Adaptive intelligent systems have the mechanisms for defining and using internal user's model (pupil, student). On the basis of this model, inference mechanism, upon the base of knowledge, generate the solutions that are adopted to particular situation. A special type of these systems are opened systems

enabling user to access the model defined by the system during interactive work, i.e. during the dialog [9].

For development adaptive intelligent knowledge based systems we use computer technologies based on classic (hard-bull) logic, but also use new techniques of soft computer technology and new artificial intelligence based on Fuzzy logic and on neural networks [15], [10]. The main goal of new approaches is to adjust those systems to habits and capabilities of individual users. Neuro-fuzzy systems can learn from their own experience and allow using imprecise (fuzzy) terms.

III. SEARCH STRATEGY IN PROBLEM AREA

Presenting problems in state space is based on the set of state and the set of operators, which transform one state into another. Problem solving is add up to finding a number of operators which are used for transforming baseline into target state. Two main methods of heuristic search are based on production and reduction systems. Searching strategy is used for defining states which would be visited during problem solving. If we visit the state by blind, random method, we do not have many chances to find a solution. Therefore, we must put the searching process in order and define appropriate control strategy. Depending on knowledge about the problem, we define syntax and heuristic strategies, which can be irreversible and experimental. Irreversible strategies include irrevocability of chosen state and operator, while experimental strategies allow certain corrections if decide to use some other operator. In that case, we must go back to already visited state and make corrections on the operator.

Searching strategies of problem area enable implementation of teaching methods. So far, in development of educational computer software, three main teaching methods can be noticed [18]:

1. Diagnostic method including computer program that tries to evaluate students' knowledge by asking questions and, afterwards, evaluating the response.
2. Socratic dialogue method in which computer program motivates the student to recognize his fallacies and correct them.
3. Training method, which monitors the students' work but it does not influence on it constantly.

IV. OPEN AND CLOSED WORLD REASONING

For a long time it was thought that each program working option must be programmed and predicted. The development of automated reasoning systems (ARS) has disproved this rule! The universality of reasoning procedure in ARS ensures the independency of the system in relation to specific problem area and possible working variables used by the user. Besides, ARS can be used in problems in which we can not define the solution in advance. Of course, abovementioned can be applied under certain conditions and limitations.

ARS includes the system of program procedures which enable making conclusions based on given premises. In fact, ARS carry out modeling of the logic

reasoning process in a computer. In practice, the most important ARS are:

- Automated theorem proof (ATP), resolitional and non-resolitional type.
- DEDUCTIVE SYSTEMS, LOGIC PROGRAMMING (PROLOG, LOGPRO, DATALOG, BASELOG),
- INFERENCE ENGINE IN EXPERT SYSTEMS.

ARS defines formal proof that B is syntactic consequence of given assumptions A_1, A_2, \dots, A_k , where statements and assumptions are written in formal language and the proof itself can be defined using formal rules. The semantic meaning of this formal proof, defined in ARS, is: For each interpretation where A_1, A_2, \dots, A_k are true, the conclusion B is true, too. B is semantic consequence of A_1, A_2, \dots, A_k assumptions. If the assumptions are formulas, which are axiom in a formal theory, then, formula B (for which we have found the proof) is the theorem of this theory. That is why we call ARS a theorem prover.

One of the most important drawbacks in automated reasoning are undecidability and algorithmic incapability to recognize feasibility in formal theories of predicate calculation type (Cherc 1936, see, for example [6]). The proof of this pessimistical result is valid for all times, but the signs of this pessimism originate from two sides: there are a lot of decidabile theory fragments which, in general are undecidabile, and it can be replaced by semi-decidability (Erbran 1930, see for example [6]).

The latter one statement is crucial for ARS development and it includes:

There is a procedure which, if B is a consequence of A_1, A_2, \dots, A_k assumptions, can recognize this fact in defined number of steps (in defined time)

However, if B is not a consequence (and we do not know that), this procedure will search for an answer endlessly and it will not give one. Therefore, ARS can give one of the following answers:

- I know that B is a consequence of the assumptions (answer YES)
- I know that B is not a consequence of the assumptions (answer NO)
- I don't know (not feasible in defined time and space)

As for decidabile theory, or its part, ARS is capable to give an answer YES of NO except in case when they are prevented by spatial and time resources.

In such logic concrete concept, known as open world concept, ARS give NO for an answer only when they prove that B is contradict to assumptions (it means that negation is a consequence of assumptions).

Unlike the open world concept, practical reasoning has lead to closed world concept. It is not logically complete but it is acceptable in many applications. In this concept, ARS gives NO for an answer in case when B can't be carried out from assumptions and when it can't

prove that (in PROLOG we have adopted a concept of 'final failure'), [3]. We should be very careful with this concept. This is very important if we apply ARS in education process because it is not acceptable for ARS to give NO for an answer when they are not capable to prove the hypothesis of the students. For example, if the fact that Greece is a Mediterranean country does not exist in ARS base the NO answer, in closed world regime, would misinform the student. However, if we check student's answers on testing, ARS, which is working in closed world concept (all correct answers are in its knowledge base), rejects each student's answer that can't be deducted by ARS. It is acceptable if we are completely sure that the base is complete.

One flexible solution in relation to open, closed and half-closed world concepts has been described in BASELOG system in papers [12], [13]. CWA-controller and its specific application in education have been described in these papers.

V. IMPORTANT MODALITIES OF ARS APPLICATION IN E-LEARNING

Obtained results in development of ADT [1],[19], Prolog [3], Logpro [2], Datalog [16] and Baselog [12] systems have improved the ARS efficiency up to the practical applicability in specific situations. As for teaching concept, communication with computer is very important for improving individualization and differentiation processes.

In most cases, the dialogue between computer and student is added up to using menu, entering orders or coded answers by keyboard, drawing with mouse or writing short answers. As for quantity and quality, this kind of laconic dialogue is very far from the real dialogue. The quality of dialogue depends on the level of user's freedom, what can he demand from computer, how can he define those demands and in which way the answer can be presented, [8], [5].

Our aim is to present the contribution of ARS to improving the quality of computer-student dialogue. Following possibilities are pointed out:

- a) generating answers on students' questions
- b) evaluating student's hypothesis
- c) finding contradictions in students' statements

ARS work:

- the answer is deduced and is presented to student
- system asks further information from student
- system says that it can not answer the question

The range of questions, which can be asked by the students, is very wide. Questions include: who, where, what, if, how, how much, etc. Question Why is very important. This group includes the possibility that student can ask ARS to explain its work and why is further information needed. ARS gives the possibility to check students' hypothesis and to find contradictions in student's statements.

Some systems, according to [14], have the possibility to sort students' answers into following categories:

- (1) Correct answer.
- (2) Part of the answer is part of correct answer.
- (3) Incorrect, but educationally applicable answer.
- (4) 'I don't know' answer.
- (5) Incorrect answer, but there is a hint of knowledge.
- (6) The answer shows that student didn't understand the problem.
- (7) The combination of abovementioned answers.

Depending on the type of the answer, the system carries out the tutorial process.

VI. CONCLUSION

Present results of problem solving theory and automated reasoning give new light to knowledge, learning and reasoning phenomenon. These phenomenon are no longer related to human beings only and learning and reasoning for people can be seen in a new technical-technological environment. Together with modern scientific and technical solutions, we can find new perspectives for improving individualization and differentiation in teaching and learning processes.

Unlike the solutions for classic data bases, deductive data bases, based on automated reasoning systems, enable generating facts which are not explicitly in the base but are generated by the system during its work. It improves the quality of computer-student dialogue, students have more freedom in communication with computer and can learn more actively through creative experiments and research.

Adaptive intelligent knowledge based systems ARS are modern phase in development of didactical software for e-learning.

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Petar Hotomski (1944 – 2011). The presented paper is an abridged and translated version of the previous work of Prof. Hotomski. The paper contains ideas, views and opinions of author and thus reflects his personal scientific viewpoint. From scientific point of view, paper gives directions of future research.

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Business Process Model and Elements of Software Design: The Mapping Approach

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Abstract - Approach to mapping elements of business process model to elements of software design elements has been described in this paper. Primitive processes are mapped to software functions, i.e. use cases, while data dictionary and data stores are mapped to data model elements.

I. INTRODUCTION

After completion of business process modeling, a phase of software design is starting. Business process models (diagrams, data dictionary) as well as client requirements present material needed for the phase of software design, i.e. design of information system [1]. Design is usually presented by UML diagrams, followed by textual (semi-formal) specifications as well as data model diagrams.

This paper describes approach to mapping business process models to models related to software functions

design and design of data models. This approach could be applied in particular cases in practice, establishing the link between two important phases.

II. THEORETICAL BACKGROUND

The core processes in software development within information systems development is based on two main streams: functionality and data [2]. Real-world business process knowledge is presented as business process model and specification of client requirements is captured. Two parallel processes (for functionality and data) are carried on particular steps in requirements analysis and design, which are technology independent processes and implementation, which are technology dependent processes. Figure 1. shows enhanced model that was presented in [2].

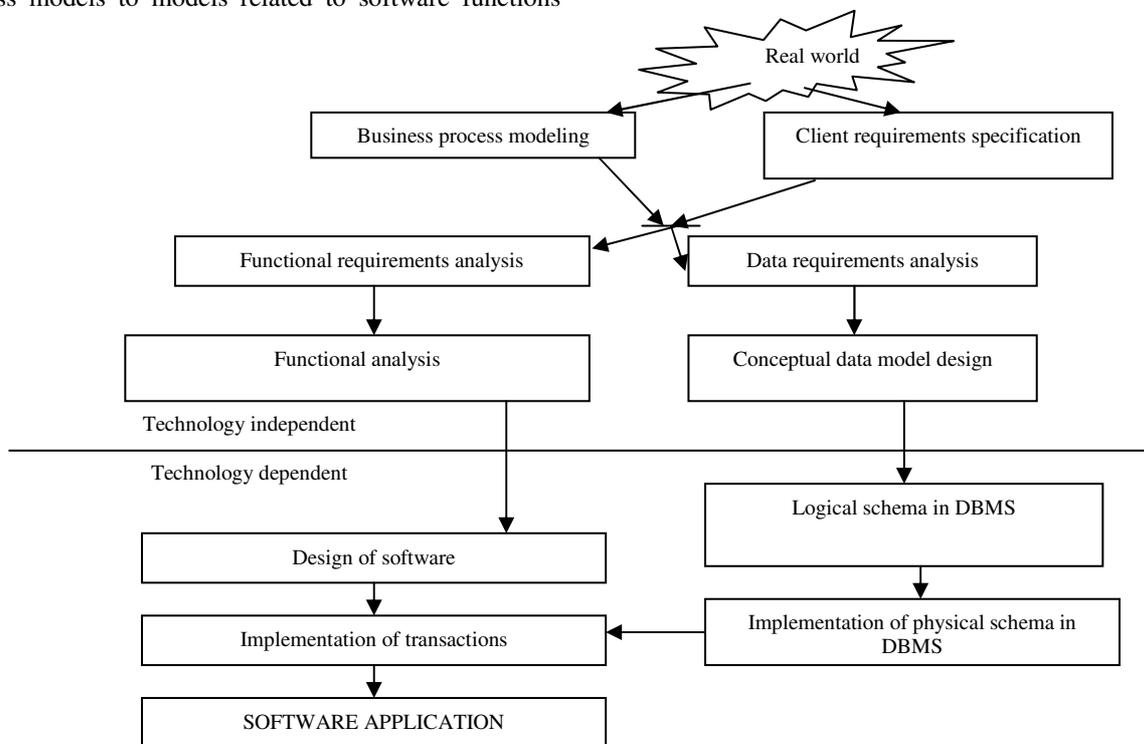


Figure 1. "Two main-streams based" model for software development for information systems (enhanced model from [2])

III. THE MAPPING APPROACH

Figure 1. shows two main streams of activities:

- Functionality related.
- Data related.

For each of them as an input material is used:

- Business process model.
- Client requirements specification.

According to [3] and [4], the mapping approach includes:

- for functionality - each primitive process from business process model is related to one or many software functions, i.e. use cases that enable particular business process to be implemented by using information technologies and software functions
- for data - each primitive process is assigned to data sub-model, each data dictionary item is assigned to entity attribute, each data store is decomposed to sub-set of entities from data model.

IV. FUNCTIONALITY DOMAIN

In functionality domain, practical mapping approach is applied by creating a textual table (Table 1.) that would have a column related to primitive business proces and a column related to set of software functions that implement particular business process.

In order to fill the second column, creative efforts are to be engaged. Results of this creative work (second column) is then filtered or enhanced by client requirements specification.

TABLE I. TABLE STRUCTURE FOR TEXTUAL MAPPING PRIMITIVE PROCESS TO SOFTWARE FUNCTIONS

Primitive business process	Software functions
Primitive process 1	Software function 1,
	Software function 2,
	Software function 3

Usually software functions that implement particular primitive process (second column) are related to a data manipulation such as data input/edit/delete, a presentation of data in tabular form or printing documents, filtering data etc.

After having this table filled, UML's USE CASE diagram could be created according to second column. Since more precise data, that describe software function, are needed for USE CASE diagram, there could be more columns describing more precisely proposed software solution, such as (Table II):

- user profile assigned to certain software function,
- software module that particular software function could belong to, etc.

TABLE II. ENHANCED TABLE STRUCTURE FOR TEXTUAL MAPPING PRIMITIVE PROCESS TO SOFTWARE FUNCTIONS

Primitive business process	Software functions	User profile	Software Module
Primitive process 1	Software function 1	User profile1	Software module1
	Software function 2	User profile2	Software module2

There are certain heuristics recommendations that could be used in this process of mapping business processes to software functions:

- It is not obligatory that each primitive process has to be mapped to a software function. If it is not possible or needed, we write "N/A" or "not supported by software".
- It is intended to let creativity be free, to have as much as possible software functions that could be applied.
- From the multitude of all software functions that could be mapped, in the second column should be left only those that could really be usefull and really used in everyday working environment; those that are not implementable, applicable or useful should not be written or omitted afterwards.
- There are some business processes that are technology supported and organizationally related, but not all are needed to be software supported.
- In suggestions for software functionalities there could be many alternatives. That is the reason why software functions are to be grouped and organized as: NEED TO HAVE and NICE TO HAVE software functions. At the first iteration, NEED to HAVE software functions should be implemented, while NICE to HAVE functions are left for another iteration or other iterations according to priority list.
- Some software functionality suggestions could be related to software already developed or inherited solutions by others. These solutions should be described and distinction is to be made between the proposed solution and existing solutions available.

V. DATA RELATED DOMAIN

Conceptual data modeling is considered as one of the most difficult processes, since it is based on business process knowledge and client requirements specification. There are many different approaches to data models creation. Integration of different approaches to creating conceptual data model and other data models is applied at Technical faculty "Mihajlo Pupin" Zrenjanin, Serbia within Information systems education and students' practical laboratory work. This integration is described within strategy approaches (Table III) and followed by information systems development phases (Table IV).

TABLE III. STRATEGY APPROACHES AND INTEGRATION OF METHODS FOR DATA MODEL CREATION ([5])

Strategy	Method	Material
Iterative and increment refinement		
At each IS development phase	Requirements collection	Text that describe business process and client requirements
	Business process modeling	Business process models
	System design	UML models of system design
Direct modeling	Complete model	
Sequential / partial modeling	Integration of sub-models for each:	- Primitive process from Structured System Analysis
		- USE case from UML
	Taking material:	- Attributes
		- Data flows (Structured System Analysis)
		- Data stores (Structured System Analysis)
		- XML message
	Grammar analysis of text regarding:	Lifecycle of business process
		Use case specification - action steps
	Using design patterns	
	Normalization	Data stores
		Data flows

TABLE IV. INTEGRATED DATA MODEL CREATION METHODS FOLLOWED BY INFORMATION SYSTEM DEVELOPMENT PHASES ([5])

IS development phase	Material	Method	Result	Activity order
Requirements of Business domain and client	Textual description of main processing object lifecycle	Grammar analysis of nouns and verbs - candidates for entities and relations	1st draft model - only entities	1
Business process and data flow modeling	Structured System Analysis model	Creating sub-models for each primitive process	Final complete model verification by dividing to sub-models and checking: completeness or entities and relations. Each sub-model has entities for reading and writing data, since each primitive process has input and output data flows	5
	Data dictionary - attribute	Each attribute from data dictionary has entity mapping ("belongs to some entity")	2nd draft model - adding attributes to existing entities (from 1st draft) or deriving more entities from attributes (attribute has to have an entity to belong to)	2
	Data dictionary - data store	Each data store from Structured System Analysis model is to be normalized. Using substructure notations to analyze and derive sub - entities from a data store	3rd draft model - transforming each data store to set of entities and appropriate attributes, consolidating with entities from 1st and 2nd draft	3
Creating conceptual data model	1st, 2nd and 3rd draft data model	Creating a complete model by corrections and adjustments	Final model corrected by- Abstraction, redundancy validation, Adding missing attributes and identifiers, Extraction of general data from specific data	4
Creating physical model	Final conceptual model	Adding indexes for preserving semantic uniqueness	Physical (relational) model with added indexes	6
Implementing database		Automatically by using CASE tool	Database file, ready for data entry	7

VI. CONCLUSION

Information system development starts with knowledge captured from business real-world organizations and specification of client requirements. Results of business domain modeling are diagrams, process tree and data dictionary. Results of client requirements specification include description of needed functional and data aspects. After that initial core processes, two main-stream set of activities are performed: functionality related and data related. Each of

these sets of activities uses business process modeling results and client requirements specifications as input.

In this paper we show the mapping approach between business process model elements and core design elements: software functions and data model. Mapping between business process and software functions is performed within textual tables. These software functions present basis for later creation of use case diagrams, specifying use cases for functionality of software. Mapping between elements of business process model and

data dictionary to data models is described within integrated approach of different methods.

Future work in this field would include development of automated procedures that could enable implementation of presented mapping approach and application to diversity of business process domains.

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Impact Assessment of Urban GPS Positioning Error On Intelligent Transport Systems Road Use Charging Service

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Abstract - Performance of modern satellite navigation systems open a wide range of new Information and Communication Technologies' (ICT) applications, enhancing sustainability, energy efficiency and friendliness to the environment. Introduction of the Road Use Charging (RUC) scheme aims to provide a framework for optimal management of road traffic resources and fair charging for the actual road use. Since the RUC scheme relies upon an accurate and robust position determination, the choice of satellite navigation system for the task is obvious. Still, satellite navigation suffers from ambient-induced sources of positioning estimation error that can undermine its role in RUC scheme. Here we present a case study conducted in Zagreb, Croatia with the aim to assess the probabilities of false negative (Type I) position estimation errors. As Type I errors may cause erroneous impression on the actual position of the vehicle on the specific kind of the road, thus affecting the charging process, it is essential for RUC deployment to assess the probabilities of the false identification. The results of the analysis of Zagreb experimental data reveals compliance of GPS positioning performance to the task of accurate and robust position estimation for RUC.

I. INTRODUCTION

The Information and Communication Technologies' (ICT) Road Use Charging (RUC) scheme [1] is expected to be introduced throughout the European Union as an improvement in fair charging of the road usage, as well as the means for traffic control and optimisation. The scheme entirely relies upon the accurate and robust identification of a vehicle on the particular segment of the road network, a task to be completed by utilisation of satellite navigation technology [2].

However, urban environment extends a number of challenges to satellite navigation [3–6]. In order to assess the feasibility of utilisation of satellite navigation technology (Global Navigation Satellite System - GNSS) for RUC purpose, an assessment of the correct GNSS-based identification of a vehicle on the particular road segment should be conducted. Here we present the results of the Zagreb centre study of the impact of GPS-based (GPS - Global Positioning System) positioning error on reliability of the RUC service. Our analysis show a fair performance of the sole-GPS-based positioning for RUC, and we propose additional actions to even improve the performance of the GPS positioning for RUC.

II. PROBLEM DESCRIPTION AND PREVIOUS RESEARCH.

A. *The need for Road Use Charging (RUC).*

The strategies of sustainable economic growth and environmental concerns call for efforts in road traffic optimisation on the global scale [7]. Making road traffic optimised, safe, efficient and environmentally-friendly has become the task of a national, regional and global priority [2], [7]. Considering the maturity level of (mobile) communication systems, the Information and Communication Technology (ICT) services have been already recognised as the attractive and feasible means for road traffic optimisation, and provision of safety [8], energy efficiency and reduction of carbon and pollutants emission [9]. The concept of Road Use Charging has emerged as an effective tool for road traffic optimisation and control, with the aim to provide a fair scheme for charging of road use based on distance travelled, the nature of used road (local, motorway, in city centre etc.) and the time of usage (rush hour). Regardless of the means and schemes for travelling data collection, an accurate and robust position estimation system should be in operation in support of the RUC system.

B. *Intelligent Transport System (ITS).*

The Intelligent Transport System [9] is a novel approach in utilisation of the ICT in general mobility [10] and traffic management and operation, especially on roads. Combining the powerful computing architectures with efficient data storage, robust and fast mobile data communications and accurate and reliable positioning services (especially those satellite-based, such as GPS, Glonass, EGNOS and Galileo), ITS offers a wide variety of new traffic information and traffic management services that optimise the road traffic, considerably increase energy efficiency and safety, and curb the emissions of carbon and pollutants.

C. *RUC as an ITS service.*

RUC combines position estimation techniques with computing and mobile communications in a way that allows for recognition of time and place (road segment) of road usage, thus allowing for fair charging for road use. Considering its concept, RUC belongs to the group of the ITS services [1]

D. Role of positioning in RUC.

An accurate, reliable and robust position estimation process is essential for RUC deployment. Regardless of the means for presentation of travelling data to the charging authority (daily submissions of weighted distance, calculated by On-Board Unit, or near-real time position reporting), the RUC system must be capable of the accurate identification of particular road use in all conditions. The choice of satellite navigation system (GPS) is apparent, considering its remarkable position determination performance [3], [5].

E. Challenges of GPS utilisation for RUC positioning.

Satellite navigation is by far the best single position estimation method in operation today. Using the US GPS system in ideal conditions of the full visibility of the sky, the GPS horizontal error falls below 5 m, providing an excellent framework for development of numerous applications for Intelligent Transport Systems. Several sources of positioning errors (the space weather and ionospheric disturbances, in particular) [3], [11–14] may temporarily affect the GPS positioning performance [3], [4], [6], but it still remains at acceptable levels of positioning errors. However, the situation deteriorates considerably in urban positioning environments, where significant reduction of sky visibility, increased multipath effects and sudden ionospheric disturbances either separately or combined produce more frequent and notable deteriorations of GPS positioning performance.

III. GPS POSITIONING ERROR IMPACT ASSESSMENT ON RUC SERVICE.

A. Requirements.

RUC position estimation system should provide accurate position estimates regardless of positioning environment. The level of accuracy needed for RUC deployment is determined by requirement that a vehicle should be accurately identified on the real road segment. Considering the width of a road line of 5 m, this means that a reasonable position estimation accuracy requirement may call for position estimation error of up to 20 m in order to avoid misidentification (critical situation of the two parallel roads). The same level of accuracy may be required in a densely populated city centres, with a narrow streets in rectangular fashion.

Besides the accuracy, position estimation system for RUC should be reliable in order to provide continuous positioning service. This requirement is particularly demanding in the cities, considering a number of RUC service users and challenges of positioning environment.

B. Methodology and design of the experiment.

The impact of the GPS positioning error on RUC service is assessed here through an investigation on the probability to identify a GPS-enabled vehicle travelling a public road, and thus eligible for payment of its use, as a vehicle travelling different road (with perhaps different charging scheme) or not travelling a chargeable road at all. This misidentification apparently results from the error in the vehicle's positioning estimate, thus representing an important cornerstone in RUC service implementation.

A sort of measurement error drawing the attention is referred to in statistics as the Type I, or false negative, error [15], [16]. In essence, it incorrectly rejects the hypothesis that a vehicle is on the chargeable road, due to a measurement, position estimation, and error.

An assessment of a Type I GPS-related RUC error was conducted based on a set of experimental data collected during a field campaign in Zagreb city centre, Croatia. The choice of the experimental environment was driven by the assumption that urban areas presents the most challenging environments for GPS-based RUC-related positioning process, with the highest probability of Type I errors.

A family car was driven on the path in Zagreb city centre, with parallel streets (roads) separated by at least 30 m. The car's position and horizontal positioning errors observables, obtained from a commercial Garmin GPS receiver using the proprietary extension of the NMEA-0183 protocol, were collected every 2 s, and stored for the later post-processing.

The post-processing software was developed in R environment [17]. It processed the experimental data statistically [15], [16], and provide the means for identification of the probability of Type I error based on the largest acceptable positioning error for GPS-based RUC service.

C. Experimental results.

Collected horizontal GPS positioning errors range from 6 m to 25 m, this is shown in spatial distribution of horizontal GPS positioning errors along the experimental path on Fig 1.

Occasional losses of satellite signals appear, depriving the vehicle's GPS unit from performing positioning estimation every 2 s. Still, the non-positioning intervals were very short and of the individual nature, thus allowing for nearly continuous position estimation.

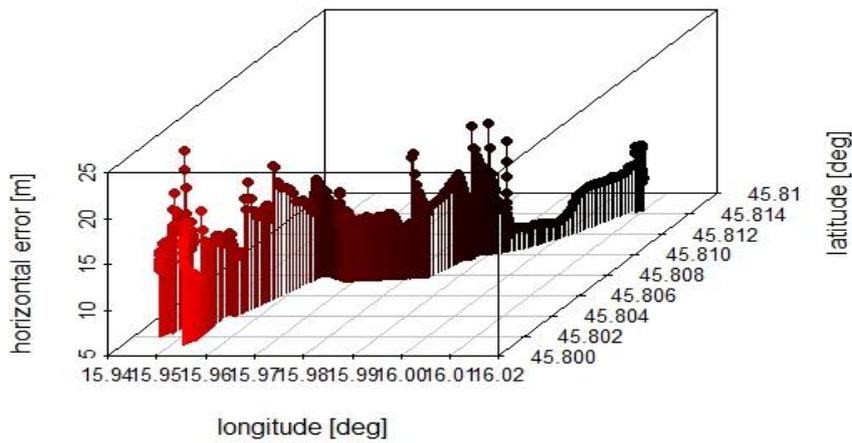


Figure 1. Spatial distribution of horizontal GPS positioning errors along the experimental path in Zagreb city centre

IV. DISCUSSION

The field campaign results show a fair reliability of the positioning service, with only occasional loss of satellite lock.

The GPS positioning accuracy assessment also shows the performance acceptable for the purpose of RUC. Detailed analysis of the histogram of horizontal GPS positioning errors (Fig 2.) reveals less than 1% of samples failed to comply to 20-m accuracy level requirement set in Chapter III., providing the estimation of Type I error probability of less than 1%.

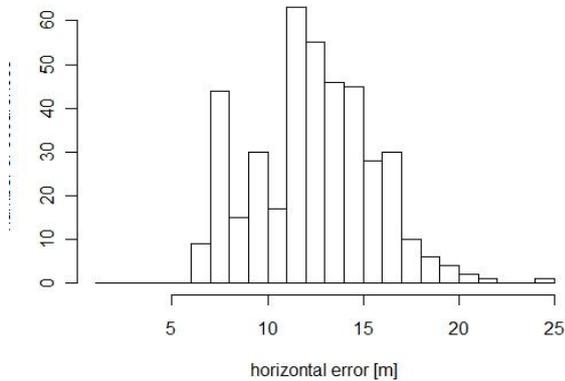


Figure 1. Histogram of horizontal GPS positioning errors as a basis for "false negatives" (Type-I RUC error) identification

Still, the critical environments (city centres with very narrow streets) may call for stronger requirements for the accuracy. With the parallel roads separation of 30 m, the position estimation accuracy requirement should be set to 15 m in order to assure the proper identification of the road segment used. In such a case, a bit more than 20% of

the Zagreb city centre samples failed to comply to the position estimation accuracy requirement, yielding the estimation of Type I error probability of 20% .

A graphical presentation of Type I errors for Zagreb city centre filed campaign is given in Fig 3. It provides a valuable insight on the limitations of sole-GPS use for RUC in relation to initially set requirements for the position estimation accuracy.

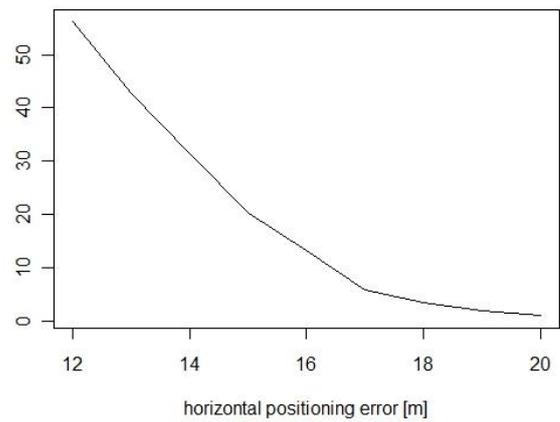


Figure 2. Percentage of occurrences of positioning errors (vertical axe) exceeding the level values (horizontal axe) as an estimation of RUC Type I error probability curve

V. CONCLUSION AND FUTURE WORK.

The Road Use Charge scheme is among the most promising ICT-based services, aimed to contribute to road traffic optimisation, increasing energy efficiency and road safety, and combat carbon and pollution emissions. Fundamentally relying upon accurate and reliable position estimation, RUC is expected to utilise satellite navigation as the basic position estimation technology.

In an attempt to assess the potential limitations and risks of GPS-based RUC, we conducted a field campaign in Zagreb, Croatia, and devise the Type I (false negative identification) error probability curve from collected horizontal GPS positioning error observables. A 20-m horizontal GPS position estimation error level yields a 1% probability of Type I error, which confirms that GPS may serve as an appropriate technology for RUC-related position estimation.

Future work will focus on both Type I error and Type II error probability curves estimation in city centres and the other critical environments for GPS/GNSS-based positioning and their applications.

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Inter-banking Communication for Foreign Currency Exchange Rates Based on XML

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Abstract - Aim of this paper is to show how XML could be used in communication between banks and exchange offices. It has been shown on the example of XML that contains data about foreign currency exchange rates. This XML file is used within software created for an exchange office.

I. INTRODUCTION

In recent years we are facing the fact that Extensible Markup Language (XML) has become a standard format of files for data exchange. XML is often used as an interoperability media between heterogeneous software systems and it is very often used with web services in e-commerce systems [1].

Usually there is a software that creates XML file (mostly upon previously extracted and filtered data from a database), and another one that reads that file and uses the XML file content. This paper presents software that is designed for foreign currency exchange offices. Foreign currency exchange rates are delivered in the form of XML by Central National Bank of Serbia. Exchange office could download XML with foreign currency exchange rates from official Central National Bank and use this data for daily transactions.

II. THEORETICAL BACKGROUND

A. Business-to-business data exchange

There are several models of data exchange in e-Business systems, described as:

- B2C (business to customer/consumer),
- B2B (business-to-business),
- C2C (customer to customer) and
- C2B (customer to business) [1].

Business-to-business presents a data exchange model that enables direct data exchange between companies, i.e. their business processes. One company depends on other company data in order to fulfill business activities tasks. They exchange data in on-line and off-line mode via computer networks, such as Internet.

B. XML

Extensible Markup Language (XML) is not only a data format, but it presents a technology for communication, commonly used for presenting and organizing data. [2]

XML presents a commonly accepted (by W3C consortium) standard format for documents, that is simple (based on tags) and therefore easily understandable, but also flexible for adaptation to be used with different purposes [3].

III. THE CONCEPT OF SOLUTION

In this section will be presented a software solution that has been developed at Technical faculty "Mihajlo Pupin" at course "Information systems in banking and insurance" [4]. While developing their software solutions assigned as practical exams, students are getting knowledge and skills required for professional environments in the field of programming of software solutions for banking information systems.

The concept of software solutions is described as follows:

Central National Bank of Serbia on daily basis publishes foreign currency exchange rates by using different media. One of them is official website of Central National Bank of Serbia [5]. At this website, official foreign currency exchange rate for each day is available in the form of downloadable XML file.

Other banks as well as exchange offices could download particular XML file and use it in daily operative activities.

Figure 1. shows the concept of the proposed solution. The left side presents central national bank software components (database, internal client server application, web application, XML exchange rates archive), while right side presents software parts of bank or exchange office information system.

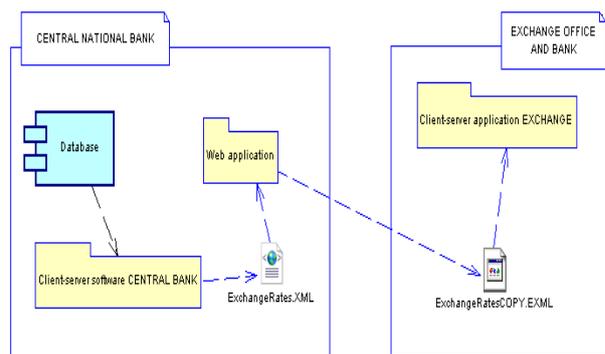


Figure 1. Concept of proposed solution - component diagram

IV. XML FOR FOREIGN CURRENCY EXCHANGE RATES

Here XML file structure and data, containing daily values of foreign currency exchange rate, downloaded from National Bank of Serbia official website [5] is presented.

```
<?xml version="1.0" encoding="UTF-8"?>
```

```
<Exchange_Rates_List>
```

```
<header>
```

```
<Copyright>Given the technical possibilities of the network, the National Bank of Serbia cannot warrant the completeness and reliability of the data and information presented. Only the data and information printed directly from the computers of the National Bank of Serbia (not via the network) are reliable, accurate and complete. The National Bank of Serbia is not liable for any damage arising from using the data from this website. Downloading, reproduction and distribution of files from the website is allowed by the National Bank of Serbia, so long as the content of such files is not changed and the source is always visibly specified. The National Bank of Serbia warns that making any unauthorized changes to the data on its website, deleting or destroying or making such data unavailable, or intentionally incurring damage, is prohibited and illegal. All rights retained by the National Bank of Serbia.
```

```
</Copyright>
```

```
<No>42</No>
```

```
<Date>05.03.2012</Date>
```

```
<Type>FOREIGN EXCHANGE</Type>
```

```
</header>
```

```
<Item>
```

```
<Code>978</Code>
```

```
<Country>EMU</Country>
```

```
<Currency>EUR</Currency>
```

```
<Unit>1</Unit>
```

```
<Buying_Rate>110.3668</Buying_Rate>
```

```
<Selling_Rate>111.0310</Selling_Rate>
```

```
</Item>
```

```
<Item>
```

```
<Code>36</Code>
```

```
<Country>Australia</Country>
```

```
<Currency>AUD</Currency>
```

```
<Unit>1</Unit>
```

```
<Buying_Rate>89.5907</Buying_Rate>
```

```
<Selling_Rate>90.1299</Selling_Rate>
```

```
</Item>
```

```
<Item>
```

```
<Code>124</Code>
```

```
<Country>Canada</Country>
```

```
<Currency>CAD</Currency>
```

```
<Unit>1</Unit>
```

```
<Buying_Rate>84.4623</Buying_Rate>
```

```
<Selling_Rate>84.9705</Selling_Rate>
```

```
</Item>
```

```
<Item>
```

```
<Code>208</Code>
```

```
<Country>Denmark</Country>
```

```
<Currency>DKK</Currency>
```

```
<Unit>1</Unit>
```

```
<Buying_Rate>14.8408</Buying_Rate>
```

```
<Selling_Rate>14.9302</Selling_Rate>
```

```
</Item>
```

```
<Item>
```

```
<Code>392</Code>
```

```
<Country>Japan</Country>
```

```
<Currency>JPY</Currency>
```

```
<Unit>100</Unit>
```

```
<Buying_Rate>102.9541</Buying_Rate>
```

```
<Selling_Rate>103.5737</Selling_Rate>
```

```
</Item>
```

```
<Item>
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```
<Code>578</Code>
```

```
<Country>Norway</Country>
```

```
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```

```
<Unit>1</Unit>
```

```
<Buying_Rate>14.9042</Buying_Rate>
```

```
<Selling_Rate>14.9938</Selling_Rate>
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```
</Item>
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```
<Item>
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```
<Code>752</Code>
```

```
<Country>Sweden</Country>
```

```
<Currency>SEK</Currency>
```

```
<Unit>1</Unit>
```

```
<Buying_Rate>12.5220</Buying_Rate>
```

```
<Selling_Rate>12.5974</Selling_Rate>
```

```
</Item>
```

```
<Item>
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<Code>756</Code>
```

```
<Country>Switzerland</Country>
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```
<Currency>CHF</Currency>
```

```
<Unit>1</Unit>
```

```
<Buying_Rate>91.4996</Buying_Rate>
```

```
<Selling_Rate>92.0502</Selling_Rate>
```

```
</Item>
```

```
<Item>
```

```
<Code>826</Code>
```

```
<Country>United Kingdom</Country>
```

```
<Currency>GBP</Currency>
```

```
<Unit>1</Unit>
```

```
<Buying_Rate>132.3502</Buying_Rate>
```

```
<Selling_Rate>133.1466</Selling_Rate>
```

```
</Item>
```

```
<Item>
```

```
<Code>840</Code>
```

```
<Country>United States</Country>
```

```
<Currency>USD</Currency>
```

```
<Unit>1</Unit>
```

```
<Buying_Rate>83.6303</Buying_Rate>
```

```
<Selling_Rate>84.1335</Selling_Rate>
```

```
</Item>
```

```
</Exchange_Rates_List>
```

V. THE SOFTWARE SOLUTION

In this section the client-server software solution will be presented, developed for use at exchange office. This software has been created by using tools: Microsoft Visual Studio 2008 Professional Edition and database management system SQL Server 2005.

A. Main menu

After login, main form is presented with main menu. Items from main menu are:

- **File**
 - Exit,
- **Exchange**
 - We Buy,
 - We Sell,
 - Converter,
- **Reports**
 - Buy – report on buy transactions
 - Sell - report on sell transactions,
- **Help**
 - Software - software basic data
 - About Me -software author's basic data.

B. "We buy" user interface

In order to enable saving transactional data about foreign currency buying, a small database has been developed (Figure 2).

Column Name	Data Type	Allow Nulls
TransactionID	int	<input type="checkbox"/>
Amount	int	<input type="checkbox"/>
Country	varchar(14)	<input type="checkbox"/>
Currency	varchar(3)	<input type="checkbox"/>
BuyingRate	money	<input type="checkbox"/>
TotalAmount	money	<input type="checkbox"/>

Figure 2. Database table structure for Buy option

In order to buy foreign currency, user interface form "We buy" could be started. A user chooses a kind of a foreign currency by selecting an item from combo box list. Figure 3. shows situation after choosing the kind of a foreign currency. After that moment, the appropriate variable values for the choosen currency extracted from the XML data is displayed in text boxes (Figure 3).

Figure 3. Situation after choosing type of foreign currency

In the text box named "Enter Amount" the amount of money that will be bought is entered. After entering the amount, button "Sum" is used in order to calculate the value of the chosen currency. If the operation is accepted by client, the transaction is recorded with "Insert Transaction" button. If the transaction is successful, appropriate message box appears (Figure 4).

Figure 4. Situation after successful "Insert Transaction" operation

This way, transaction is saved in database table "Buy" (Figure 2).

C. "We buy" form - implementation

Implementation of "We buy" user interface form functionality is based on several programming sequences related to:

- Reading from XML document and filling in combo box with data

```

XmlDocument doc = new XmlDocument();

doc.Load("C:\\IS\\InformacioniSistemi\\InformacioniSistemi\\kl_20120305_1.xml");
XmlNodeList nodeList =
doc.SelectNodes("Exchange Rates List/Item");
foreach (XmlNode node in nodeList)
{

comboBox1.Items.Add(node.SelectSingleNode("Country").InnerText);
}
    
```

- Reading from XML particular data for selected foreign currency and presenting the data in text boxes

```

XDocument xmlDoc =
XDocument.Load("C:\\IS\\InformacioniSistemi\\InformacioniSistemi\\kl_20120305_1.xml");
var RateList = from item in
xmlDoc.Descendants("Item")
where
item.Element("Country").Value ==
comboBox1.SelectedItem.ToString()
select new
{
Code =
item.Element("Code").Value,
Currency =
item.Element("Currency").Value,
Unit =
item.Element("Unit").Value,
BuyingRate =
item.Element("Buying_Rate").Value,
Country =
item.Element("Country").Value,
};
foreach (var item in RateList)
{
textBox2.Text =
item.Country;
textBox3.Text =
item.Currency;
textBox4.Text = item.Unit;
textBox5.Text =
item.BuyingRate;
textBox6.Text =
Convert.ToString(Convert.ToDecimal(textBox1.Text) / Convert.ToDecimal(textBox4.Text) *
Convert.ToDecimal(textBox5.Text));
decimal a =
decimal.Parse(textBox6.Text);
decimal b = Math.Round(a,
2);
textBox7.Text =
b.ToString();
}
    
```

- Writing the transactional data to database

```

SqlConnection con = Program.GetConnection;
SqlDataReader dr = null;
try
{
    
```

```

        SqlCommand cmd = new
        SqlCommand("INSERT INTO Buy (Amount, Country,
        Currency, BuyingRate, TotalAmount) VALUES
        (@Amount, @Country, @Currency, @BuyingRate,
        @TotalAmount)", con);
        cmd.Parameters.AddWithValue("@Amount",
        textBox1.Text);
        cmd.Parameters.AddWithValue("@Country",
        textBox2.Text);
        cmd.Parameters.AddWithValue("@Currency",
        textBox3.Text);
        cmd.Parameters.AddWithValue("@BuyingRate",
        textBox5.Text);
        cmd.Parameters.AddWithValue("@TotalAmount",
        textBox7.Text);

        dr = cmd.ExecuteReader();
        if (dr.Read())
        {
            MessageBox.Show("Insert
            Failed");
        }
        else
            MessageBox.Show("Insert
            success.");
        this.Close();
    
```

D. Reports on transactions

The data stored in database could be searched and seen in various ways:

- In tabular form (Figure 5.)
- In the form of printed reports.

TransactionID	Amount	Country	Currency	BuyingRate	TotalAmount
37	0	EMU	EUR	110.3668	110.3700
38	1	EMU	EUR	110.3668	110.3700
39	10000000	EMU	EUR	110.3668	1103668000.0000
40	23	EMU	EUR	110.3668	2538.4400
41	1	United States	USD	83.6303	83.6300
42	1	Japan	JPY	100.9541	1.0000

Figure 5. Tabular presentation of stored data about transactions

E. Other forms

One of other forms is "We Sell". The program code is similar to form "We Buy". The only difference is in Sell Rate that is taken from the same XML file.

Yet another form is "Converter" that enables converting rates to be presented for pairs of foreign currencies (Figure 6).

Buy/Sell	Round
110.3668	110.37
100.9537	1.00

Total without Round: 100.125
TOTAL: 100.12

Figure 6. Converter form for a pair of foreign currencies

VI. CONCLUSION

In this paper we presented a software solution that could be used in exchange offices. This software solution uses XML file downloaded from National Bank of Serbia official website. The XML file contains data about selling and buying exchange rates for different foreign currencies.

In this paper we presented concept of proposed software solution, user interface and part of user manual that explains how a user could use the software. Implementation details are given in the form of interesting segments of programming code followed by comments. Particularly "We buy" functions were explained from user and implementation perspective. Other forms are similar as "We buy".

Future development would be continued in creating and Web services for process automation of data acquisition from XML that is stored at National Bank of Serbia.

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Managing the Risk of Information Systems in SME's from the Aspect of the ISO Standards

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Abstract - Risk management is undoubtedly essential for any company's business operations. This article supports the thesis that small and medium sized enterprises (SMEs) must apply all necessary procedures and actions in order to identify and deal with risk actively. Implementing risk management systems yields numerous benefits to organizations. Risk management efficiency in enterprises is manifested in complete coordination of all components and appreciating the interdependence of various factors, both in terms of target definition levels and across in organization segments, including the enterprise as a whole.

A separate issue is information security in the light of ISO standards. Introduction and adherence to quality standards (ISO 9001 at least) is the first and imperative step towards success. This article will present the risk of introducing international standards in small and medium sized enterprises.

I. INTRODUCTION

Modern-day enterprises encounter various challenges in their operation and development. The best results are achieved by enterprises capable of turning these challenges into their business into opportunities for improving their operations, adopting new technologies and gaining market share.

A. The concept of risk

Risk is present in performing any process or task, but it is not equally manifest and significant everywhere. Whereas the risk of the occurrence of problems is very low in case of operative, i.e. routine processes, processes qualified as projects may be characterized by very high risk [1].

Uncertainty or insecurity can also be defined as lack of information, knowledge or understanding regarding the outcome of an action, decision or event.

Terms "possible avenues of action (alternatives)" and "possible (uncertain) realization" point to uncertainty. Risk can be considered only in the context of a specific alternative. Risk does not mean a certainly forthcoming negative effect; it is a negatively assessed consequence whose occurrence is uncertain.

B. The significance and aim of risk management

Both in theory and practice, all organizations exist and function under conditions of uncertainty. Risk management is the process of identifying, assessing and pro-

cessing risks with consistent and repeatable procedures and methods for segments or the entire organization. Risk management does not seek to eliminate risks completely, because this is impossible in practice, but to create an environment where optimal business decisions can be made taking into account identified risks and consequences they can cause [2].

The significance of the above is reflected in the fact that an organization's management makes decisions based on objective and comparable data rather than on subjective inferences or intuition. Risk management process identifies the direction and the intensity of engaging resources in order to mitigate the consequences of unacceptable risks. At any rate, risk management reduces the potential damage to the organization if risk does come about. This damage is always expressed in financial terms, and accounts for reduced profit. Proper risk management, therefore, directly influences loss and cost control, i.e. increases likelihood of higher profit.

C. Risk management in accordance with the ISO 31000 standard

The ISO 31000 risk management standard proposes and defines risk management process, and the basic structure of the process is shown in Figure 1 [3]. The basic elements of risk management are:

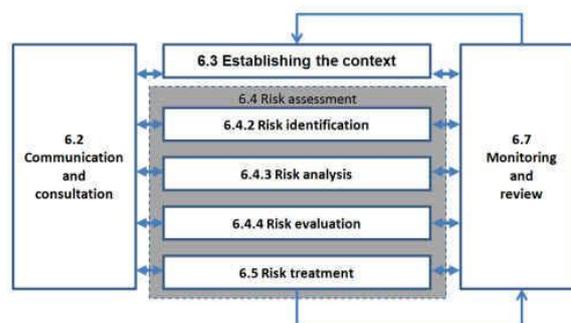


Figure 1. Change management process according to ISO 31000

- Communication and consultation: Communication and consultation with internal and external investors, i.e. stakeholders, as appropriate (technologically) at every step of the risk management process and considering the process as a whole.

- Context determination: Determining the external, internal and risk management contexts in which the rest of the process will proceed. Criteria must be set for risk assessment and defining analysis structure.
 - Risk identification: Identifying where, when why and how events could be prevented, mitigated or postponed, or goal accomplishment increased.
 - Risk analysis: Identifying and assessing the existing controls. Determining the consequences, probability and the level of the risk. This analysis considers the area of potential consequences.
 - Risk assessment: comparing the level of risk with previously established criteria and considering the equilibrium between potential benefits and unfavorable results, which enables making decisions on the scope and nature of required processing and priorities.
 - Risk processing: Devising and implementing specific cost-effective strategies and action plans for increasing potential benefits and reducing potential costs.
 - Monitoring and reviewing: It is necessary to monitor the efficiency of all the steps of risk management process, important for constant improvements. It is necessary to monitor the risks and efficiency of processing measures in order to ensure that changes in conditions do not change priorities.
- enhances its reputation;
 - improves strategic awareness;
 - defines the ownership of risky assets;
 - improves control over the influence of change;
 - provides help in changing business culture;
 - secures a higher level of decision transparency;
 - enables better business planning;
 - facilitates sensitivity analysis;
 - improves corporate awareness and information transfer;
 - enables avoiding confusing systemic errors;
 - improves understanding vulnerability;
 - increases the likelihood of goal accomplishment;
 - improves planning business continuity;
 - minimizes insurance costs, etc. constant advances and enhancements in the organization.

All of these advantages become prominent if they can be measured and thus demonstrate profitability of investing in improving risk management levels.

Risk management is an extremely important segment in the overall management of an organization and its activities. Every organization uses one form of risk assessment or another, often without being aware of it. ISO 31000 offers the possibility of defining the risk management principle, i.e. business process for it, with all the elements of systematic and documented approach. The ISO 31000 is a worldwide consensus in terms of applicability, and is fully harmonized with other ISO standards, such as, for instance, ISO 9001, ISO 14001 and ISO 27001, and provides a possibility of relative simple integration into the Integrated Management System (IMS).

ISO 31000 provides a complete environment for the risk management process, and a realistic basis for continuous improvements to the organization's working conditions in terms of insecurity.

ISO stipulates that risk management includes the following principles [4]:

- participating in surplus value creation;
- being an integral part of other business processes
- participating in decision making;
- addressing insecurities specifically;
- being systematic, structured and timely;
- being organized and completed based on the best information available;
- being adapted to the need of the organization and industry where it is used;
- taking human and cultural elements into account;
- maintaining dynamic and iterative character as well as response to change;
- enabling constant advances and enhancements in the organization.

Unless the entire risk management system explicitly supports the above principles, then it neither has purpose nor is of use to the enterprise. Applying the risk management system offers many advantages to the organization:

II. ENTERPRISE RISK MANAGEMENT

According to COSO [5], having defined the vision, mission, strategy and policies, enterprise management also implies achieving the objectives of the strategy defined at all levels as:

- strategic;
- operative;
- dependable reporting objectives; and
- compliance with laws and regulations the likelihood of goal accomplishment;

These goals place various aspects of risk in focus, which should be dealt with and are a responsibility of a whole range of persons.

According to COSO, risk management comprises eight interrelated components:

- internal environment

- objective setting
- event identification
- risk assessment
- response to risk
- control activities
- information and communication
- monitoring activities;

There are direct relations between the goals that the enterprise wants to achieve and risk management components, which are the description of activities required for accomplishing goals. These interdependencies are shown in Figure 2 [5].

The effectiveness of enterprise risk management is reflected in total harmonization of all components and appreciating the interdependence of various factors, both in relation to objective definition levels and in all divisions of the organization, as well as the enterprise as a whole.

Although risk management yields many advantages in the enterprise’s operations, there are certain limitations, primarily in the human factor, as most of the analysis results are subject to subjective assessment. Nevertheless, risk management is an inevitable activity for any enterprise.

A. ISO 9001 quality management (from the risk aspect)

Implementation of risk management in organizations is not mentioned in the ISO 31000 Standard, but the ISO 9001:2008 standard specifies it as follows [2]: “Introducing the quality management system should be an organization’s strategic decision. Formation and implementation of

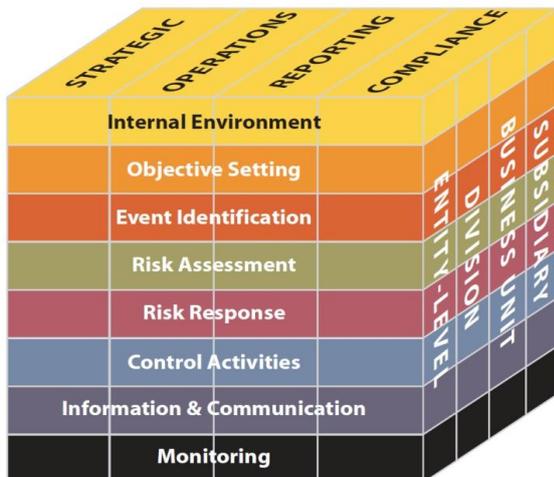


Figure 2. 3-D model of enterprise risk management

the organization’s quality management standard are influenced by the organization’s environment, changes in this environment and risks related to this environment, etc...”

In other words, a risk management process is essential to implement in any organization. Analysis of the type and level of activity in an organization can demonstrate that there are three levels of management by hierarchy: process management, as the lowest level, operative management and strategic management as the highest level.

In accordance with this, risk management also has three levels: process (and project) risk management, operative risk management and strategic risk management. Figure 3 [2] shows the hierarchical levels of risk management in an organization (Note: project risk management is at the same level as process risk management).

In addition to this, the ISO 9001:2008 standard also requires the necessary process-oriented approach, by which all and any activities within an organization must be presented in one of the business processes, i.e. procedures. In the above stated context, one can infer that another process intended for risk management must be introduced within all the business processes that are already identified in an organization. This process has all the characteristics described in the ISO 31000:2009 standard. What is significant in all this is that this process must be integrated with other processes. By its purpose and significance for the organization, it belongs in the group of what we call managing processes.

When viewing and analyzing the purpose of the ISO 9001:2008 standard related to risk management, it can be said that it represents a desire and effort to plan the organization’s business for the present and future in the conditions of uncertainty. This vitally influences the potential buyers, clients and partners to choose this specific organization, as they have evidence of the management’s concern for stability and long-term operation through



Figure 3. Hierarchical levels of risk management in an organization

continued analysis of threats and constant struggle against their realization with negative effects.

A special issue is information security in the light of ISO standards. Not elaborating on ISO 27001 standard, but based on the most recent revision of the ISO 9001:2008 standard, we identify the significance of risk management through managing information flows in an enterprise's information system [6].

The new revision of the ISO 9001:2008 standard directly points out that information is essential for the functioning of an organization, and thus the Quality Management System (QMS). Below are only some of the examples from the ISO 9001:2008 standard referring to information and the necessity of manipulating them (generation, transfer, processing, storage, retrieval and delivery to users:

- 4.1. General requirements
- 5.6.2. Review input data
- 7.4.2. Purchase information
- 7.4.3. Acquired product verification
- 7.5.1. Manufacture and service provision monitoring
- 8.2.1. Customer satisfaction
- 8.4. Data analysis

When information is discussed at the above listed places, it is not only about information essential for the organization's functioning, but also the one essential within the QMS. In this context, information is a resource like any other found in an organization. Most often, information is classified as what we call intangible assets, unlike tangible ones such as, for instance, equipment, machinery, tools, buildings, small inventory, fixed assets, etc.

Intellectual capital, which, among other things, creates competitive advantage, is defined as the employees' knowledge that they transform into market value. The word "intellectual" in the concept of intellectual capital means that the source of this capital is intellect, i.e. knowledge in various forms.

In practice, two forms of intellectual capital, i.e. knowledge are found in organizations:

- explicit – existing in the form of plans, blueprints, patents, licenses, databases, handbooks, bylaws, corporate standards, computer programs, etc.
- implicit – existing in workforce's minds, such as knowledge, visions, ability to act, problem-solving skills, leadership, culture, experience etc., referred to as tacit knowledge in professional literature.

Another close relationship between intellectual capital and legislation is one of the forms of Intellectual Property Law. According to ISO 9001, any national legislation is the foundation and obligation to be met by the established QMS, which also includes legislation pertaining to intellectual property.

It can be concluded that intellectual capital is a set of information within an organization and thus within the QMS itself.

In order to further elaborate on the manner and possibilities of treating information as a resource in an organization, i.e. QMS, some basic concepts need to be clarified.

Firstly, information refers to any data of value for owners, holders and/or users in a context.

Information system is an arranged set of resources and rules with one or more roles in the processes of information generation, transfer, storage and processing.

The main characteristics of information usage are described through three aspects:

1. Information confidentiality, in the sense that the information can only be used or processed by authorized personnel;
2. Information integrity, described by the feature that information cannot be changed without the knowledge of the information holder, also including information processing method; and
3. Information availability, meaning that the information must be made available to the user where and when necessary.

Providing the existence of these three aspects constitutes the basis of the information security system, dealt with in the ISO/IEC 27001:2005 standard: Information technology — Security techniques — Information security management systems — Requirements. This standard defines information security as permanent provision and enhancement of information confidentiality, integrity within the information system.

B. The significance and content of ISO/IEC 27001:2005(from the risk aspect)

The ISO/IEC 27001:2005 standard [7] is a set of requirements to be met to certify the information security management system. The standard is fully harmonized with ISO 9001:2008, so that its structure is very similar to other certification standards. The key sections are:

0. Introduction
1. Scope
2. Normative reference
3. Terms and definitions
4. Information security management system
5. Management responsibility
6. Internal ISMS audits
7. ISMS verification by management
8. ISMS enhancement

Annex A (normative): audit purposes and audits

Annex B (informative): OECD principles and this international norm

Annex C (informative): overlapping points of ISO 9001:2000, ISO 14001:2004 and this international standard.

The key purpose of the standard is to meet the requirements securing the accomplishment of the three key aspects of information confidentiality, integrity and availability (C-I-A).

It must be emphasized that ISO/IEC 27002:2005 states that information is an asset that, like other important business assets, is essential to an organization's business and consequently needs to be suitably protected [7].

Information is one of the most important resources in an organization, and consequently must be appropriately treated within the QMS.

III. CONCLUSION

Risk management is of key importance for an enterprise's operations. Small and medium sized enterprises (SMEs) are no exception to this, and, albeit to a different extent, must apply all the necessary procedures for the identification of risk and active attitude to it. Introduction and adherence to quality standards (ISO 9001 at least) is the first and imperative step towards success. Alongside innovation and change, insistence on procedure and product and process quality control is the SMEs' path to intensive development and equal market position.

The article identifies the risks of introducing international standards in small and medium sized enterprises, and mostly elaborates on risks common to all business entities. This is due to the facts that the main obstacle, the high price of the system, was mostly unsurpassable for SMEs, and possible failure of introduction could have disastrous financial consequences for the enterprise. Over the past year, costs of acquiring and implementing solutions have been better adapted to SMEs capacities, with-

out major degradation of the IS, thus creating opportunities for speedy introduction, primarily of ERP and CRM solutions. The number of SMEs in Serbia with introduced systems is statistically negligible (only 7.6% of small enterprises) [8], but with a rapidly growing trend. Forthcoming research will show whether this assumption is sustainable, and whether the price, time of introduction, and – above all – managements' commitment to this process will be at the expected level. The current research led to a conclusion that the attitude of managers and owners to this issue in SMEs is the key to successful introduction and implementation of information systems.

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Implementation of Baselog System as an Expert System Shell in IT Education

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Abstract - This paper presents how expert systems can be used in education area. Baselog system, developed on Technical faculty "Mihajlo Pupin", is used as an expert system shell. Basic characteristics and uniqueness of this system are described, as well as parts of school lessons from curriculum for secondary school. Generated axioms as a parts of an expert system shell are listed. At the end few examples of possible pupil queries with different answers from system are described.

I. INTRODUCTION

Our aim is to presents the Baselog software as an expert system that can be used in IT education. Baselog system, developed on Technical faculty in Zrenjanin, could help pupils in secondary school in the classes of computing and information technology to determine the type of computer system components. Specifically, this program as an expert system can help students to determine whether a particular component is an input or output device, system or application software.

II. BASELOG SYSTEM

Baselog system concept and its program implementation enabled the integration of good properties of Datalog, Prolog and ATP system, and so is realized a more flexible system in reference to the work in the closed, respectively opened world [1]. Specific needs in the development for the work with databases ask just development and application of such system, and it makes it more superior in reference to Datalog, Prolog and ATP system, considered separately [2], [3], [4], [5].

Some automated reasoning systems can give incorrect answers if they work in closed world concept [6], or correct answers if they work in open world concept where the answer depends on fact base completeness [1]. If fact, the base is incomplete, some of automated deduction systems can consult facts from various extension files. In order to enable work with greater data amount there arose a need to access certain databases which can even be distant and then take the piece of data which could be used for deducting a conclusion [7], [8].

For knowledge databases is also characteristic the open world assumption. In the open world regime works classic systems for the automatic theorem proving, especially, ATP system [9], [10]. The knowledge bases contain limited knowledge segments from a certain field. They can be incomplete, i.e. they do not present total

relevant knowledge. The applying of the closed world concept on such databases can bring wrong answers to the asked questions. Because of that the pure concept of the closed world can not be applied for the databases used in the education computing software.

Universal resolution systems from theoretic aspect totally support the work with databases as well, but they show a practical deficiency. It can be seen in the fact that because of the endeavoring to get a semantically expected answer, it is necessary to give a complete space description where the solution is claimed.

In the database area it is, for example, exposed through the necessity of proposing following axiom:

$$t \neq t_1 \wedge t \neq t_2 \wedge \dots \wedge t \neq t_n \Rightarrow P(t) \quad (1)$$

Where $t_1 \dots t_n$ are the relation database tuples, and $P(t)$ means the tuple t belonging to the database relation (\sim is negation).

As it can be seen, already for little number of tuples in database, this axiom has big length, so this theoretic possibility is left in practical applications. Both in Datalog and in Prolog it is made the attempt for solving this deficiency in specific ways. In Prolog it is the strategy of definite failure [5], [6], [11] and in Datalog the CWA-principle [4]. Meanwhile, no one of these solutions can satisfy education needs in fullness, for the following reasons.

In reference to possible user's questions, there are following options:

- 1) the answer to the question is deducible from the base,
- 2) the answer to the question is not deducible from the base,

Where in 2) we differ:

- The answer needs to be affirmative,
- The answer needs to be negative.

In a) when the answer is deducible from the base; it will be found and presented to a user either Prolog, Datalog or Logpro are based on ATP-system.

Specificities are being reflected in b). According to the adopted the CWA-assumption in Datalog, respectively the definite failure concept in Prolog, there are possible incorrect or indefinite answers. So in b1) Datalog can

generate the incorrect answer NO, while Prolog's answer "NO" can be interpreted as "uncertain". In b2) Datalog answer "NO" is correct, and Prolog answer "NO" can be interpreted as "NO". In both cases b1) and b2) Logpro based on ATP gives answer "uncertain".

We observe that in educative meaning Datalog according to the b1) does not satisfy, while Prolog and Logpro based on ATP give acceptable, but uncertain answers. In b2) Datalog gives correct and precise answer, while Prolog and Logpro based on ATP gives inadequately precise answers. From the educative aspect it is desirable to lessen the indefiniteness of the system answer and it is necessary to eliminate the unallowed answers. Otherwise, there is need to keep the definiteness present in Datalog for b2) and eliminate unallowed answer from b1). Implementing Baselog-system projected on the list of the CWA-predicate and the CWA-rule, a flexible concept has been realized. Such system all predicates which are in the CWA-list treats as Datalog, in closed-world, while all the other predicates treat in open world, i.e. works as ATP. With it, it is free of Prolog defects in reference to the negation treatment and the definite failure concept.

The basis for Baselog - system makes following components [3], [5], [12]:

- The CWA-predicate list, which is a part of the program,
- The CWA-rule,
- The CWA-controller by which is enlarged ATP resolution system.

The whole Baselog - system is the extension of the resolution method by the concepts of the opened and closed world. By the CWA-controller one provides doing a degree of the world openness/closeness for the program predicates.

Every literal of the form $R(w_1, \dots, w_m)$ where R is predicate name mentioned in the CWA- predicate list, and w_1, \dots, w_m are arguments, Baselog - system will treat in the closed system regime, while all the other predicates that are not in the CWA-predicate list, by the system will be treated in the open world regime. Here, the CWA-controller of Baselog-system uses the CWA-rule, formulated in the following way.

III. THEORY ELEMENTS FROM THE SCHOOL LESSON

Computer systems or computers are electronic machines that handle incoming information (data or commands) and from them produce outputs and results. Initially, the computer is often referred to as an electronic brain, but it is still "a machine without intelligence", because it only executes instructions. Bearing in mind that the computer system is only a machine that works by a particular program, we can say that each computer consists of two components [13]:

- The machine - computer hardware,
- Programs that handles computer work - computer software.

The term hardware means the physical devices of the computer system, or all of the tangible parts, which are visible and can not be touched. [13]

Since the computer is completely useless without a program by which it operates, the second component of the computer system was named Software as opposed to the hardware. [13]

A typical computer system consists of the following components:

- Internal memory,
- The arithmetic-logic unit,
- Control unit,
- External memory unit,
- Input units,
- Output units.

The inner or central memory includes: RAM, ROM and cache. The arithmetic-logic unit and control unit are integral parts of the processor. External memory units are: hard disk, CD, DVD and flash memory. We have many other input and output units and devices, and they differ with regard to the duties they perform. Input device enables you to enter data and programs in the computer, a commonly used are: mouse, keyboard, scanner, digitizer, digital camera, microphone, camera, barcode reader and others. Output units allow viewing, printing or reproduction of information as a result of the computer and the best known are: monitor, printer, plotter, speakers, headphones, etc. [13]

To a computer system to operate against the hardware must be equipped with appropriate programs and to manage it, ie. The software can be divided into two categories:

- System software and
- Application software.

There are different approaches for classifying software. Some authors distinguish the operating systems as a special kind of software, while others believe that the operating systems of the system software. Here are the operating systems introduced as part of the system software. In addition to operating systems, system software include: software translators, drivers and various utilities (they allow the user to duplicate CDs, data compression, copying the disk to tape etc.). [13]

Application programs allow the solution of various problems, such as: word processing, spreadsheet, making drawings, working with databases, image processing, creating and managing video clipšs and animation, composition and processing of audio, different calculations science and technology, playing games and much more. These programs are written by the manufacturers of computers, specialized software houses, as well as by computer users. [13]

IV. EXAMPLE OF USING BASELOG SYSTEM AS AN EXPERT SYSTEM SHELL

Baselog system is consisted of three elements: basic axioms, self axioms and the CWA list. Users can enter this parts of program in a program that is called Baselog Editor. It is shown on "Fig.1". This enters could be formed on three different ways: like clauses, predicate calculus formulas or junctions.

After entering these three parts of program, that could be parts of an expert system shell, users can create different questions in a form of queries.

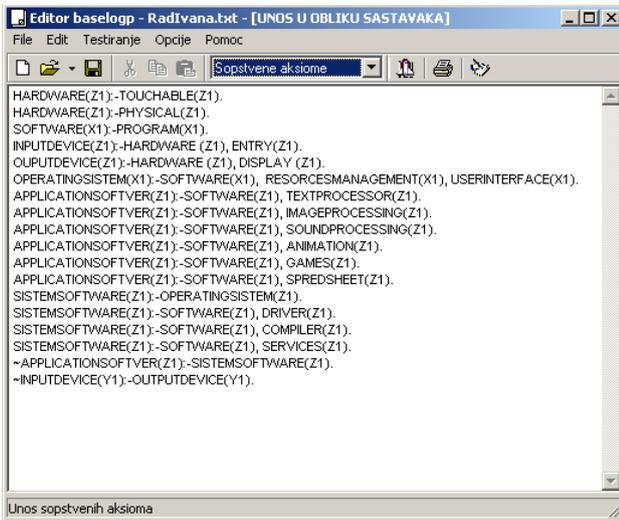


Figure 1. Baselog Editor

Answer to a user's query is accomplished by denial (refutation) of query's negation by deep strategy for arrayed axioms which make its own and base axioms. Proof is inferred with help of OL-resolution with marked literals with CWA rule. Activation of CWA rule erases last literal in central junction. This rule is activated only if OL-resolution cannot be applied, which is when last literal of central junction consists a predicate which cannot resolve with other predicates. That means that refutation of that literal is not possible. It still doesn't mean that negation of that literal is not refutable in given axiom system. If it comes up that negation of the literal itself is TRUE as a logical consequence of given axioms (for that reason OL-resolution couldn't refute it) and it implies that its negation is not a logical consequence of given axioms, so it is FALSE and must not be used as an additional conjecture, and CWA rule must not be used in this case! If it is impossible to refute the literal OL resolution will abandon the junction and skip to another one. Having in mind that the junction is a tautology, because it has the last literal which has TRUE value $T (q\vee T = T)$ it can be erased from the set of resolutions, because tautologies are not used for refutation. Still, if it appears that even negation of the last literal in junction cannot be refuted with resolution, as well as the last literal itself, then within concept of closed world it can be taken as an additional conjecture that the negation of the literal is TRUE. [14]

Testing result of chosen or created paradigm can be [13]:

- 1) Regular work and end of Baselog program where the result is YES, NO or NOT DEDUCIBLE.
- 2) Irregular work, when procedure work stops due to incorrect data input. There is often a message with explanation for occurred error cause. If an error occurs program stops its work and warns user about the type of error. If the error is corrected and testing procedure starts again, program will continue its work only if correction satisfies criteria check of input correctness.

Basic axioms, created in a form of clauses for theory elements described in part III, are:

- Touchable(Mouse).
- Inputdevice(Mouse).
- Entry(Mouse).
- Touchable(Keyboard).
- Inputdevice(Keyboard).
- Entry(Keyboard).
- Touchable(Monitor).
- Display(Monitor).
- Inputdevice(Monitor).
- Outputdevice(Monitor).
- Physical(Microphone).
- Inputdevice(Microphone).
- Physical(Scanner).
- Inputdevice(Scanner).
- Physical(Ploter).
- Outputdevice(Ploter).
- Physical(Printer).
- Touchable(Camera).
- Display(Camera).
- Inputdevice(Camera).
- Outputdevice(Camera).
- Program(Coreldraw).
- Imageprocessing(Coreldraw).
- Software(Windows).
- Resorcesmanagement(Windows).
- Operatingsystem(Windows).
- Userinterface(Windows).
- Program(Excel).
- Spredsheets(Excel).
- Program(Photoshop).
- Imageprocessing(Photoshop).
- Program(Flash).
- Animation(Flash).
- Program(Word).
- Textprocessor(Word).
- Program(Nero).
- Utility(Nero).

Self axioms, also created in a form of clauses, are:

- Hardware(Z1):-Touchable(Z1).
- Hardware(Z1):-Physical(Z1).
- Software(X1):-Program(X1).
- Inputdevice(Z1):-Hardware (Z1), Entry(Z1).
- Ouputdevice(Z1):-Hardware (Z1), Display (Z1).
- Operatingsistem(X1):-Software(X1),
- Resorcesmanagement(X1), Userinterface(X1).

Applicationsotver(Z1):-Software(Z1),
 Textprocessor(Z1).
 Applicationsotver(Z1):-Software(Z1),
 Imageprocessing(Z1).
 Applicationsotver(Z1):-Software(Z1),
 Soundprocessing(Z1).
 Applicationsotver(Z1):-Software(Z1), Animation(Z1).
 Applicationsotver(Z1):-Software(Z1), Games(Z1).
 Applicationsotver(Z1):-Software(Z1), Spredsheet(Z1).
 Sistemsoftware(Z1):-Operatingsistem(Z1).
 Sistemsoftware(Z1):-Software(Z1), Driver(Z1).
 Sistemsoftware(Z1):-Software(Z1), Compiler(Z1).
 Sistemsoftware(Z1):-Software(Z1), Services(Z1).
 ~Applicationsotver(Z1):-Sistemsoftware(Z1).
 ~Inputdevice(Y1):-Outputdevice(Y1).

CWA list for this example is for the first time empty.

Query no.1 is a following simple question that pupils could make to the system “Is the mouse an input device for computer system?” “Fig.2”:

?-Inputdevice(Mouse).

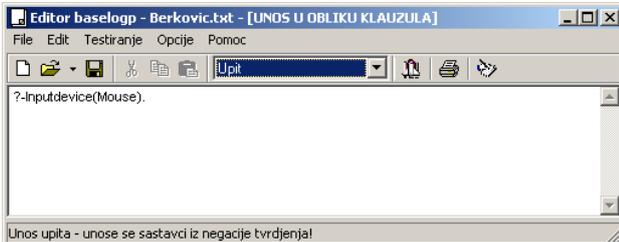


Figure 2. User query in Baselog editor

Answer for query no.1 is shown on “Fig.3”. It is “YES” because the proof is found and we can certainly say that the mouse is an input device for computer system.

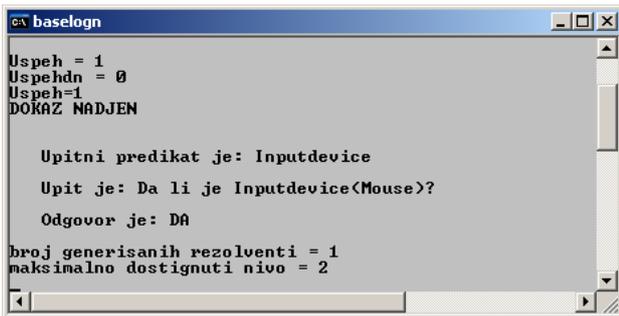


Figure 3. Answer from the Baselog system when it is “YES” created from basic axioms

Query no.2 is also a simple question made to the system “Is the mouse an operating system of a computer?”:

?-Operatingsystem(Mouse).

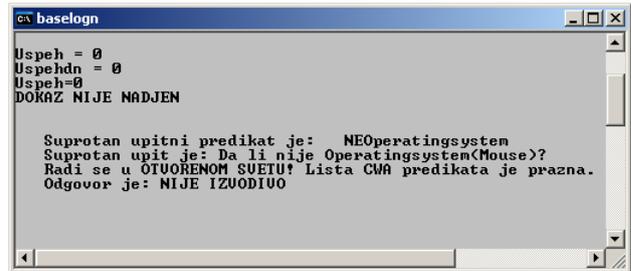


Figure 4. Answer from the Baselog system when it is “NOT DEDUCIBLE”

Answer for query no.2 is shown on “Fig.4”. It is “NOT DEDUCIBLE” because the proof is not found and the CWA list is empty, so we do not have all possible human knowledge from one area. Because of this, we can interpretate this answer that expert system does not know that the mouse is an operating system of a computer.

Query no.3 is also a question “Is Microsoft Excel an application type of software?”:

?-Applicationsotver(Excel).

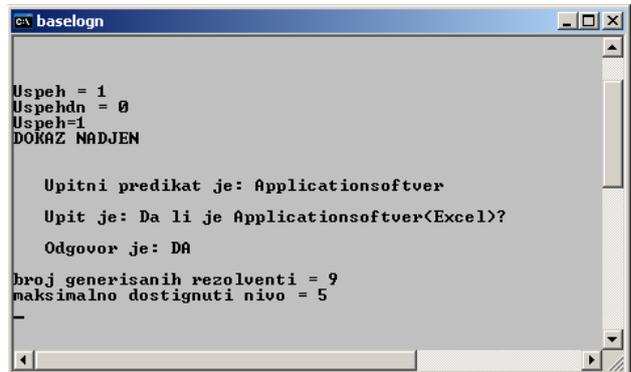


Figure 5. Answer from the Baselog system when it is “YES” created from basic and self axioms

Answer for query no.3 is shown on “Fig.5”. It is “YES” because the proof is found; literal is not found among basic axioms, but the system deducate it with help of OL-resolution with marked literals from basic and self axioms. So, we can interpretate this answer: Microsoft Excel is an application type of software!

Query no.4 is another question “Is the microphone an output device of a computer system?”:

?-Outputdevice(Microphone).

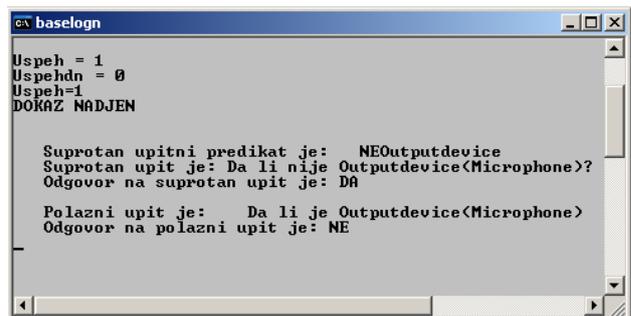


Figure 6. Answer from the Baselog system with empty CWA list

Answer for query no.4 is shown on “Fig.6”. It is “NO” because the proof for goal is not found, but the negation of that literal is refutable in given axiom system.

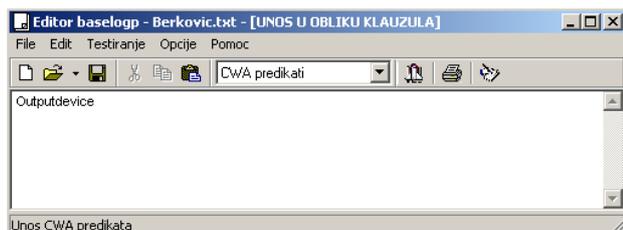


Figure 7. CWA list in Baselog Editor

If we use the CWA list in this example, shown on “Fig.7”, it must be entered the name of the predicate of an literal in this third part of Baselog program. We are now considering that we have in or shell, among basic axioms, all possible output devices that human knowledge knows. In this case answer for query no.4 is shown on “Fig.8”. It is “NO” because the proof is not found; but the literal is found among CWA predicates. So, we can conclude that Microsoft Excel is an application type of software.

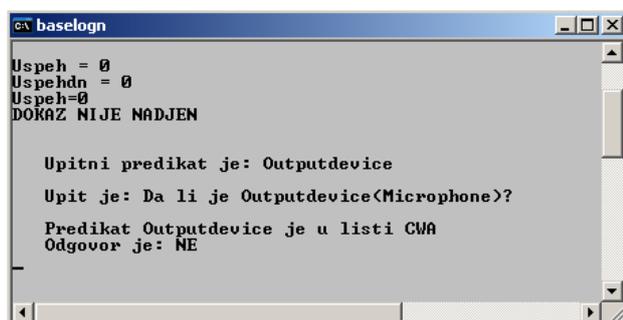


Figure 8. Answer from the Baselog system when it is NO (with predicate in CWA list)

V. CONCLUSION

The aim of this paper is familiarize readers with Baselog system for the purpose to create an expert system shell that can help primary or secondary school pupils to more easily identify the basic components of a computer system.

The expert system will in all cases where the request from real world considers “true facts” gave the correct answer – “Yes”, evidence was found. In the case of “false facts” - in an open world system was not able to prove that a query that is not correct. Return the answer is NO, but the answer is not feasible. In contrast to the closed world for this type of query system gives the answer is NO, a proof is found.

Baselog system concept is a flexible system in reference to the work in the closed, respectively opened

world. It could be applied in the following branches of education: distant learning, individualization of learning, generation of answers to questions asked by students, testing students’ hypothesis, finding contradictions in students’ answers and discovering gaps in pupils’ or students’ knowledge. [15]

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Simulating e-Commerce Client-Server Interaction for Capacity Planning

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Abstract - Contemporary ways of doing business are heavily dependent on the e-Commerce/e-Business paradigm. The highest priority of an e-Commerce Web site's management is to assure pertinent QoS levels of their Web services continually, in order to keep the potential e-Customers satisfied. Otherwise, it faces an immense possibility of losing both e-Customers and revenues, along with a big possibility of gaining bad reputation due to either poor performance or unavailability of the e-Commerce Web site. In order to avoid numerous unpleasant consequences, by designing and implementing e-Commerce Web sites that will always meet e-Customer's high expectations, a relevant performance models have to be utilized to obtain appropriate performance metrics. A continuous assessment of current performances and especially predicting future needs are the subjects of capacity planning methodologies. Within this paper, such a predictive model has been described and evaluated by using discrete-event simulation of both the client-side and server-side processes involved. In addition, the paper discusses the performance metrics obtained as a function of the intensity and quality of the workload parameters.

I. INTRODUCTION

Keeping e-Customers of a particular e-Commerce Web site satisfied has always been a task of a highest priority for its management. e-Customers' dissatisfaction can lead to company's bad reputation, loses of both current and potential e-Customers, and substantial financial loses. Besides other leading factors for e-Customers' dissatisfaction, poor Web site performance is ranked second, just behind high product prices and shipping costs [1]. Since most Internet users have broadband connections today, poor Web site performance, including even Web site crashes, have been considered the main generators of e-Customers' dissatisfaction.

According to Hoxmeier & DiCesare, user satisfaction is inversely related to response time, which 'could be the single most important variable when it comes to user satisfaction' [2]. In the virtual world of Internet, where time is money, speed is the only one-dimensional criterion that matters, whilst the expression 'faster is better' is the simplest equation in the entire field of Internet strategy [3]. Regarding the response time, the famous '8-seconds rule' has already changed. Four seconds is now considered the maximum length of time the average online shopper will wait for a Web page to load in a browser, before

potentially abandoning the retail site, with a tendency to be halved again in the forthcoming years [1].

In order to assure pertinent QoS levels of the vital performance metrics, including the response time, a capacity planning methodology, based on the usage of relevant predictive models, has to be applied continually, as a crucial part of the e-Commerce Web site deployment.

The solely aim of the process of capacity planning is to provide an unambiguous answer to the following question: 'Is the existing hardware infrastructure of a particular e-Commerce Web site capable to assure and maintain relevant Quality of Service (QoS) levels continually, having on mind the unpredictable and stochastic nature of e-Customer's online behavior?' In that context, Menascé & Almeida [4] define capacity planning as being '... the process of predicting when the future load levels will saturate the system and determining the most cost-effective way of delaying system saturation as much as possible', taking into account the natural evolution of the existing workload, the deployment of new applications and services, as well as the unpredictable and stochastic changes in e-Customer's behavior. Capacity planning requires appliance of predictive models, in order to make a prediction of the system's performance parameters, including: response times, throughput, network utilization, or resource queue lengths. All of these measures have to be estimated for a given set of known input parameters, including system parameters, resource parameters, and workload parameters.

Contrary to trivial approach of applying non-regular, intuitive, *ad hoc* procedures that rely on arbitrary rules of thumb and personal experience, which usually lack proactive and continuous, scientifically based capacity planning methodology, a very systematic and thorough approach to addressing capacity planning issues, both on a system and component level, was developed by Menascé & Almeida [4] [5]. Their approach relies on utilization of the probability theory, the construction of a state transition graph, known as Customer Behavior Model Graph (CBMG) for a particular e-Commerce Web site, and the appliance of the theory of queues and queuing networks. The resulting predictive performance models, which consist of closed-form expressions for evaluating various performance metrics, offer analytical/numerical solution, and have been developed both on a system and component level, whilst the corresponding algorithms have been

implemented in Microsoft® Excel™, using Visual Basic for Applications® (VBA) programming code.

Yet another novel approach to capacity planning, based on modeling e-Customer’s online behavior during e-Commerce shopping session, using the class of Deterministic and Stochastic Petri Nets (DSPNs), has been proposed by Mitrevski et al. [6]. It is suitable for obtaining various client-side related performance metrics, since it is also based on a CBMG of a particular e-Commerce Web site, and includes a stochastic temporal specification of the thinking times during e-Customer’s stay in three main states: ‘Browse’, ‘Search’, and ‘Checkout’ (Fig. 1).

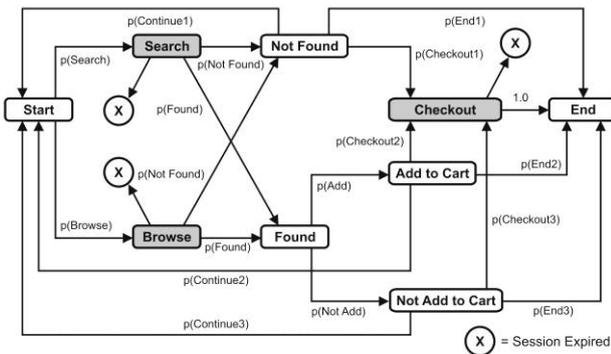


Figure 1. A CBMG corresponding to the DSPN model of e-Customer’s online shopping behavior (based on Mitrevski et al. [6])

The idea for utilizing the class of DSPN for modeling purposes is based on the fact that the underlying stochastic processes of both the e-Customer’s online session and that one of the DSPN are, in fact, of the same type, i.e. Markov regenerative processes. This approach also offers a possibility for obtaining an analytical/numerical solution, and the model can be also efficiently solved by a specialized software, like TimeNET v4.10 or DSPNExpress-NG. For the purposes of this paper, the DSPN model proposed by Mitrevski et al. [6], represented via its CBMG (Fig. 1) will be utilized only as a template for implementing the logic of an e-Customer’s online behavior within the simulation model.

II. DISCRETE-EVENT SIMULATION APPROACH TO CAPACITY PLANNING

Discrete-event simulation (DES) is one of the most widely used techniques for evaluating stochastic models. DES utilizes a mathematical/logical model of a physical system that portrays state changes at precise points in simulation time. Both the nature of the state change and the time at which the change occurs mandate precise description. Within DES, time advances not at equal size time steps, but rather until the next event can occur, so that the duration of activities determines how much the clock advances. Rather than employing any DES software simulator, we have used the open-source SimPy/Python programming environment for capacity planning purposes. SimPy (an acronym from ‘Simulation in Python’) is an extensible, object-oriented, process-based, general-purpose discrete-event simulation programming language, based on standard Python [7] [8] [9]. Compared

to software simulators, and especially to all types of analytical/numerical solution methods, the usage of simulation programming language offers the greatest flexibility in terms of modeling power, and the maximum ability to depict an arbitrary level of details. For instance, all of the following aspects of the e-Commerce paradigm have been successfully modeled in SimPy:

- the client-side, i.e. the e-Customer’s online behavior;
- the server-side, i.e. the hardware configuration of a typical e-Commerce Web site, on a system level;
- various types of e-Customers, i.e. the qualitative component of the workload specification;
- the workload intensity, i.e. the quantitative component of the workload specification;
- the HTTP requests generation, for the three main functions invoked by the e-Customer: ‘Browse’, ‘Search’, and ‘Checkout’;
- the propagation delays of HTTP requests being forwarded from clients’ browser towards e-Commerce servers and the delays of the corresponding responses, via Internet;
- evaluation of plethora of performance metrics for both client- and server-side.

In particular, our SimPy implementation of the e-Commerce paradigm internally consists of three processes (*Source*, *Customer*, and *Request*), along with their corresponding Process Execution Methods (PEMs), as shown on Fig. 2.

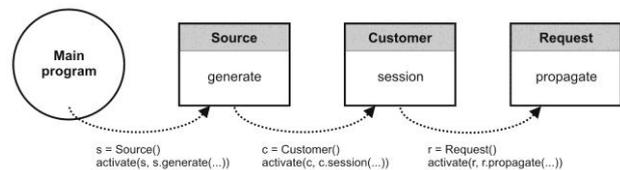


Figure 2. A schematic representation of the internal structure of the SimPy simulation model

The *Source* process implements the generation of e-Customers according to the given arrival rate, and according to the probability distribution of their type, and it also defines the parameters of the simulation runs. The *Customer* process implements the client-side, i.e. the e-Customer’s online behavior during the online session, in accordance with the CBMG, depicted on Fig. 1.

As stated previously, an e-Customer spends an arbitrary time, exponentially distributed, while being in three particular states, including ‘Browse’, ‘Search’, and ‘Checkout’. The actual thinking times for those operations are being drawn from the same exponential distributions based on the average thinking times, i.e. 1.0, 1.0, and 3.0 minutes, respectively, for all types of e-Customers, since we assume that e-Customers are all moderately experienced and need approximately the same amount of time whenever they perform those operations. If the e-Customers’ segmentation was based, for instance, on their experience (e.g. non-experienced, moderately

experienced, and highly experienced), instead on their shopping behavior, the average thinking times for the ‘Browse’, ‘Search’ and ‘Checkout’ operations would be type-dependent, i.e. the non-experienced e-Customers would be assigned considerably bigger thinking times than the highly experienced ones.

Whenever an e-Customer visits those states, a corresponding HTTP request has been generated and directed towards the e-Commerce Web site. Finally, the *Request* process implements the server-side, i.e. the propagation of each particular HTTP request through the e-Commerce Web site’s hardware infrastructure, being already specified. Each Web site’s server has been modeled on a system level, rather than on a component level. Since HTTP requests are processed by a particular server in a FIFO (FCFS) manner, each of them has been modeled as a resource with an infinite queue length, for simplicity reasons.

III. WORKLOAD CHARACTERIZATION

The performance of any distributed system, like an e-Commerce Web site, which incorporates many clients, servers, and networks, depends heavily on the characteristics of its workload. According to Menascé & Almeida, the workload of a system can be defined as a set of all inputs that the system receives from its environment during any given period of time [4]. We focus on the workload characterization of the client-side. One has to be aware of two fundamental facts: first, e-Customers are not mutually equal, having on mind their online behavior; second, e-Customers access the Web site and invoke specific e-Commerce functions in an unpredictable and stochastic manner.

The first fact is related to the *qualitative* aspects of the workload characterization. Many studies, including [10], have shown that it is possible to distinguish among various types of e-Customers, having on mind their online behavior during shopping sessions. Due to simplicity reasons, we model three basic types of e-Customers regarding the intensity of buying online, i.e. Rare Shoppers, Ordinary Shoppers, and Frequent Shoppers. The specifics of their online shopping behavior can be defined through specification of the probabilities within the CBMG (Figure 1), as shown in Table 1.

A mixture of various types of e-Customers can be specified by defining a discrete random variable along with its probability mass function (pmf). If there are k disjoint types of e-Customers identified, e.g. (t_1, t_2, \dots, t_k) , then each of them can be assigned a corresponding probability from the pmf vector (p_1, p_2, \dots, p_k) , such that $\sum_{i=1}^k p_i = 1$, as a measure of its particular participation within the workload mixture. For our proposed classification: ($t_1 = \text{Rare Shopper}$, $t_2 = \text{Ordinary Shopper}$, $t_3 = \text{Frequent Shopper}$), we are going to investigate the performance as a result of the service demand caused by three possible scenarios: $S_1(p_1 = 10\%; p_2 = 30\%; p_3 = 60\%)$, $S_2(p_1 = 33\%; p_2 = 34\%; p_3 = 33\%)$, and $S_3(p_1 = 50\%; p_2 = 30\%; p_3 = 20\%)$. It is also worthy to point out the flexibility of the model, i.e. the fact that by varying the values of the probabilities within the Table

1, it is possible to model a wide range of different types of e-Customers. For instance, for younger or novel e-Customers, the probability $p(\text{Browse})$ would be bigger than the probability $p(\text{Search})$, due to their lack of experience. Similarly, the probability $p(\text{End2})$ of ending the online session without paying, after putting an item in the shopping basket, will be considerably bigger with reluctant e-Customers.

TABLE I. DEFINING VARIOUS TYPES OF E-CUSTOMERS USING DSPN MODEL (CBMG) PROBABILITIES

CBMG (DSPN model) probabilities	Rare Shoppers	Ordinary Shoppers	Frequent Shoppers
p(Browse)	0.50	0.50	0.50
p(Search)	1 – p(Browse)	1 – p(Browse)	1 – p(Browse)
p(Found)	0.10	0.50	0.90
p(Not Found)	1 – p(Found)	1 – p(Found)	1 – p(Found)
p(Add)	0.10	0.50	0.90
p(Not Add)	1 – p(Add)	1 – p(Add)	1 – p(Add)
p(Continue1)	0.10	0.33	0.50
p(Checkout1)	0.10	0.34	0.45
p(End1)	0.80	0.33	0.05
p(Continue2)	0.10	0.33	0.50
p(Checkout2)	0.10	0.34	0.45
p(End2)	0.80	0.33	0.05
p(Continue3)	0.10	0.33	0.50
p(Checkout3)	0.10	0.34	0.45
p(End3)	0.80	0.33	0.05

The second fact is related to the *quantitative* aspects of the workload characterization. The arrival process of e-Customers is a Poisson process [11], since:

- there is a zero probability of two arrivals at exactly the same instant of time;
- the number of arrivals in the future is independent of what have happened in the past;
- the number of arrivals in the future is independent and identically distributed (i.i.d.) random variable over time, i.e. the process is stationary.

The inter-arrival times of a Poisson process comprise an i.i.d. random variable with an exponential distribution. Therefore, since the memoryless property of the exponential distribution holds at any instant of time, the expected time until the next arrival is a constant and is given by $1/\lambda$, where λ is the arrival rate [e-Customers/sec] [12]. If λ is the overall arrival rate for a given scenario (S_1 , S_2 , or S_3), each of them comprising of a mixture of e-Customer’s types (t_1, t_2, \dots, t_k) , along with a corresponding probability mass function (p_1, p_2, \dots, p_k) ,

then the arrival rate of each e-Customer's type is given by the product $\lambda \cdot p_i$ ($i = 1, 2, \dots, k$) [12].

IV. MODELING THE SERVER-SIDE

e-Commerce sites, especially those of the leading Internet retailers, have a multi-tier hardware architecture, consisting of multiple servers, distributed throughout two or more LAN segments. In such a way, the site's architecture becomes more scalable, more flexible, more reliable and highly available [13].

We model the e-Commerce server-side on a system level, as a set of resources, each having a queue with an infinite capacity. We keep in mind the simplest possible 2-tier hardware architecture of a medium-to-large scale e-Commerce system, consisting of a Front-End Server (FES), a Web Server (WS), a Database Server (DbS), an Application Server (ApS) and an Authentication Server (AuS), distributed into two high-speed LAN segments (Fig. 3).

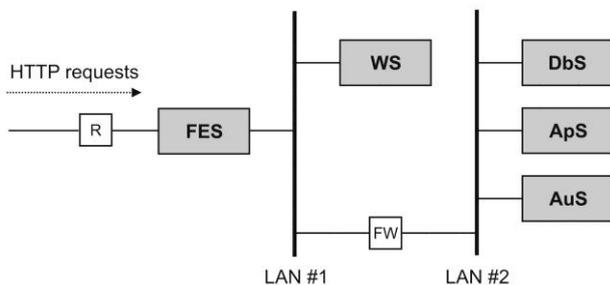


Figure 3. A schematic representation of an e-Commerce server-side hardware architecture

Each HTTP request may need several operations, i.e. types of processing by some of the back-end servers, before completing. Moreover, a request may have to be processed more than once in a particular back-end server. Fig. 4 depicts the typical Client-Server Interaction Diagram (CSID) for the 'Search' HTTP request [14].

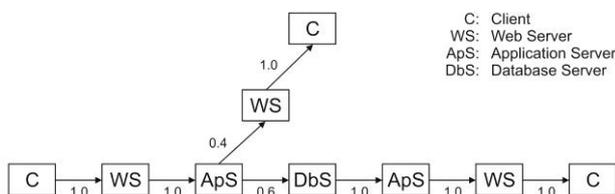


Figure 4. A CSID for the 'Search' e-Commerce function. (Source: Menascé & Almeida [14])

Table 2 shows which sequence of servers is being activated for each request type [15]. Table 3 summarizes the different back-end servers [15], along with the mean processing time [msec] and supposed standard deviation (σ). We assume that the processing time has a Normal distribution and can vary up to $\pm 10\%$ ($\pm 3\sigma$) of its mean. In addition, the propagation time (transmission delay) via Internet WANs has been modeled as a random variable with a Normal distribution and parameters $N(\mu = 0.5$ [sec]; $\sigma = 0.133333$ [sec]), which yields 99.73% of the values within the interval $[0.1, \dots, 0.9]$ sec. At the server-side, the transmission delays between the servers have

been neglected, due to the usage of high-speed LAN segments, as well as the propagation times in routers and firewalls.

TABLE II. A SEQUENCE OF BACK-END SERVERS ADDRESSED, FOR EACH SPECIFIC HTTP REQUEST'S TYPE

Type of request	Back-end servers addressed
Search	WS, ApS, DbS, ApS, WS
Browse	WS, DbS, WS
Checkout	WS, AuS, DbS, AuS, WS

TABLE III. SERVERS' STOCHASTIC PROCESSING TIME PARAMETERS

Server	Mean processing time [msec]	Standard deviation [msec]	Range of values [msec]
Front-End Server (FES)	1.0	3.33333E-05	[0.9, ..., 1.1]
Web Server (WS)	10.0	3.33333E-04	[9.0, ..., 11.0]
Database Server (DbS)	5.0	1.66666E-04	[4.5, ..., 5.5]
Application Server (ApS)	10.0	3.33333E-04	[9.0, ..., 11.0]
Authentication Server (AuS)	10.0	3.33333E-04	[9.0, ..., 11.0]

V. SIMULATION RESULTS

For each of the specified scenarios, a series of simulation runs have been carried out in order to estimate the values of various performance metrics, as a function of the arrival rates of e-Customers, ranging within the interval $[0.0, \dots, 30.0]$ [sec^{-1}] with a step of $0.5 / 0.1$. Each run took into account a time window of 7200 seconds, or 2 hours of simulated time, long enough to get steady-state values of the estimated parameters.

The response time is one of the most known and frequently used server-side performance metrics, which is of a vital interest to e-Customers. The average response time as a function of the e-Customer's arrival rate is given on Fig. 5, for the three scenarios.

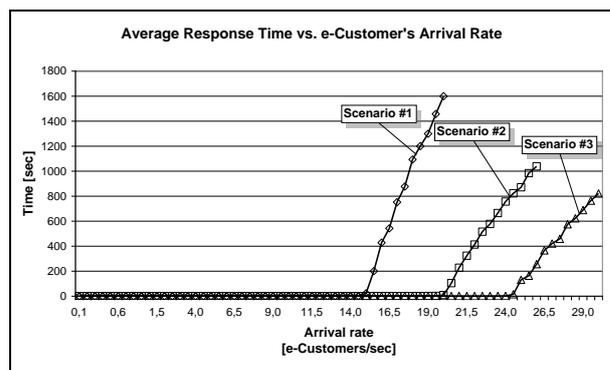


Figure 5. Average response time vs. e-Customer's arrival rate

As expected, Fig. 5 shows that the scenario S_1 generates a workload intensity that puts the biggest service

demand on the Web site's infrastructure, since Frequent Shoppers are presented with 60%. Consequently, this means more repeated invocation of 'Add-to-Cart' and 'Checkout' functions, which, on the other hand, pose greater number of HTTP requests to servers, especially to the Web server, which queues them to wait (Fig. 6), thus resulting in bigger overall processing delays, decreased throughput (Fig. 7) and decreased utilization (Fig. 8).

The estimated critical values of e-Customer's arrival rates for which the average response time reaches the

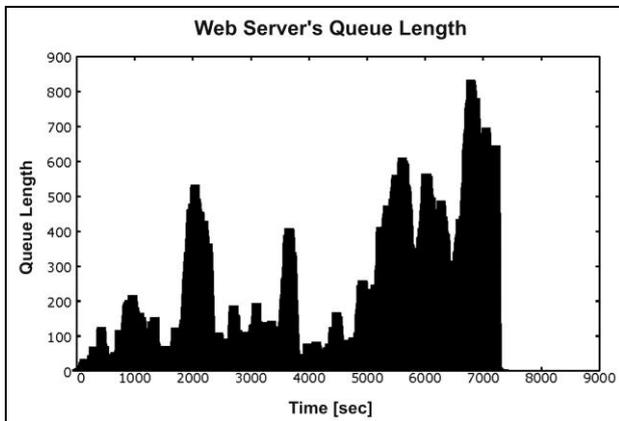


Figure 6. The dynamics of Web server's queue length over time (Scenario S_1 ; $\lambda_{S1} = 14.78$)

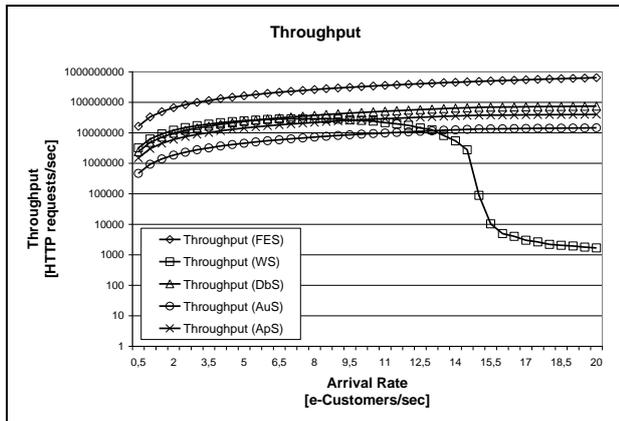


Figure 7. Throughput of various server-side systems vs. e-Customers' arrival rate (Scenario S_1).

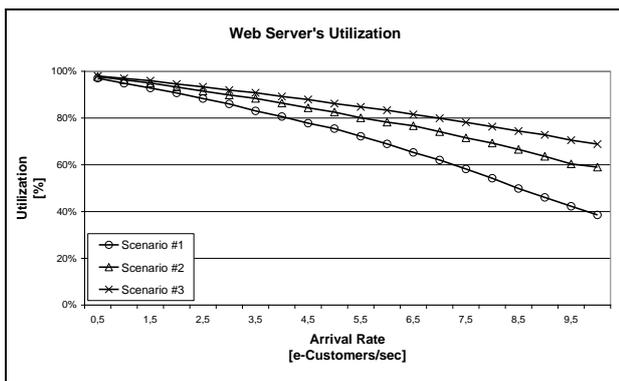


Figure 8. Utilization [%] of the Web server (WS) for the three working scenarios

'psychological' threshold of 4.0 seconds for all three scenarios, have been obtained by using linear interpolation method, and they are, respectively, $\lambda_{S1} = 14.78$; $\lambda_{S2} = 19.81$; and $\lambda_{S3} = 24.28$. The Web site's management strive is to retain at least those values, or, in the best case, to try to push them towards bigger ones, i.e. towards the right end of the axis, although during burst periods, e.g. holiday seasons, one can expect even higher percentage of Frequent Shoppers and consequently, a decrease of the critical values of arrival rates. To achieve this goal, relevant horizontal/vertical/diagonal scaling techniques of e-Commerce Web hardware infrastructure have to be applied on systems' component(s) that represent a bottleneck in the whole system, especially the Web server (WS).

Regarding the experienced response time (RT), e-Customers have been categorized into three disjoint groups, including those experiencing a RT less than 2.0 seconds, e-Customers experiencing a RT between 2.0 and 4.0 seconds, and e-Customers experiencing a RT more than 4.0 seconds. The percentage of unhappy e-Customers, i.e. those experiencing a RT lasting for more than 4.0 seconds, is increasing with the e-Customers' arrival rate, for all three scenarios. For instance, for a fixed $\lambda = 20$ [e-Customers/sec], the percentage of unhappy e-Customers is 98.69% (Scenario S_1), 67.66% (Scenario S_2) and 0.00% (Scenario S_3).

At client-side, besides numerous performance metrics that have been obtained, we first give those that can be also computed using the corresponding CBMG [4] [5] (Table 4):

- PM1: the average number of visits to each state, per session;
- PM2: steady-state probabilities of being in each state (excluding the 'Add-to-Cart' state);
- PM3: the percentage of customers that have leaved the site after having added at least one item into their shopping cart;
- PM4: the average session length [sec];
- PM5: the 'Buy-to-Visit' ratio, showing how many sessions out of the total number have terminated with buying something.

In addition, we have also obtained the following performance indicators, sublimed in Table 5, including:

- PM6: the average sojourn time [sec] spent in each state, per session;
- PM7: the percentage of sessions that have ended with an empty shopping cart;
- PM8: the average number of HTTP requests generated, per session;
- PM9: the percentage of e-Customers' sessions completed regularly (without expiring the time limit of 10 minutes);
- PM10/PM11: the average number of items being put in the shopping cart per session, both being paid for (PM10) and not being paid for (PM11).

TABLE IV. CLIENT-SIDE PERFORMANCE METRICS THAT CAN BE ALSO DERIVED DIRECTLY FROM THE CBMG

Performance metrics		Scenario #1	Scenario #2	Scenario #3
PM1	'Browse'	0,84909	0,74141	0,68267
	'Search'	0,84773	0,74106	0,68317
	'Add-to-Cart'	1,03331	0,62983	0,41752
	'Checkout'	0,50874	0,30612	0,20076
PM2	'Browse'	0.26869	0.31117	0.35036
	'Search'	0.26897	0.31242	0.35155
	'Checkout'	0.46234	0.37641	0.29809
PM3	---	≅ 10.75%	≅ 8.93%	≅ 7.27%
PM4	---	189.4 [sec]	142.6 [sec]	116.3 [sec]
PM5	---	≅ 0.5	≅ 0.3	≅ 0.2

TABLE V. ADDITIONAL CLIENT-SIDE PERFORMANCE METRICS

Performance metrics		Scenario #1	Scenario #2	Scenario #3
PM6	'Browse'	50.94720	44.54833	40.88380
	'Search'	50.89374	44.37167	40.74863
	'Checkout'	87.58523	53.67539	34.66748
PM7	---	19.62%	40.62%	53.82%
PM8	---	3.20799	2.41300	1.976329
PM9	---	98.59%	98.85%	99.02%
PM10	---	0.863179	0.507155	0.321171
PM11	---	0.157805	0.120595	0.093406

The performance metrics PM10 and PM11 can be used for estimating specific, business-oriented performance metrics, like *revenue throughput* [€/sec] and *potential loss throughput* [€/sec] [5].

VI. CONCLUSION

Discrete-event simulation by means of SimPy/Python code programming has proven to be an extremely powerful and flexible approach in modeling stochastic systems and/or processes like those already present with the contemporary e-Commerce paradigm. It allows one not only to assess a huge number of performance parameters that can be utilized for capacity planning, but also to experiment with various scenarios and hardware infrastructure's modalities, both on a system and component level. Still, the main obstacle with this approach is that it is both complex to implement and time-consuming. Regarding the substance in focus, the results obtained comply with those already given by Menascé & Almeida [4], whilst the DSPN model proposed by Mitrevski et al. [6] has proven to be a solid platform for capturing various e-Shoppers' behaviors. At server-side, future work includes performing a series of

simulations in order to investigate the effects of a horizontal/vertical/diagonal scaling of the Web server, consideration of the availability and reliability (dependability) issues, and cost issues, as well. At client-side, future work includes verification of the performance metrics already obtained, both analytically/numerically, and by usage of a dedicated software tool (e.g. TimeNET v4.10 or DSPNExpress-NG), and enrichment of the existing simulation model by including other general e-Commerce specific functions, e.g. Login/Registration, Select, Pay, etc., in order to obtain more credible results. It may also include enhancements of the simulation model by introducing new types of e-Customers, new metrics, as well as several other possible scenarios, which can lead towards building a unified simulation model capable to simulate a 24 hours' time period.

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The Importance of Transition from ERP Systems in EIM Systems Suitable for DSS

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Abstract - Knowledge economy paradigm of modern businesses are based on information technology, and management. Aggravating elements in the implementation of the e-Economy digital quality of management information, its internal audit, the need for their safety and the emergence of cyber crime. In all this, as a first step in achieving this goal is the migration mode Enterprise Resource Planning - ERP Technology in Enterprise Information Management - EIM technology, respecting all legal and regulatory practices.

I INTRODUCTION

In the business process automation, any thinking about Business Intelligence - BI, suggests thinking about a special database, Data Warehouse - DW, which is specifically geared towards multidimensional data models and sophisticated method for the preparation of "ad hoc" reports. With its encompassing architecture, Data Warehouse is the best companion of the historic post - transactional environment, where the activity of data mining can supply the necessary information, particularly with electronic market, that according to them, the management of business organizations identified key measures of the market and built a special information to be delivered or placed all interested participants in this market. In such an environment, Business Intelligence - BI should give a decision, first of all business decisions with the information they need to understand, manage, and direct the organization on the grounds that - making the right business decisions documented.

In such processes, data analysis and is used by internal auditors businesses. It is a process of identification, collection, validation, control, accuracy, analysis, and interpretation of various types of information within business organizations to further the purpose and mission of internal audit. Data analysis is typically used during construction activities to assess the situation and provide additional value through other consulting activities IIA [1].

By definition, the default is that in every business organization has to manage the business with all available resources. However, in practice, some managers of business, now in the minority, still want to point out that the business information in them did not become their critical resources. On the other hand, in today's business environment, it is thought to have become a critical business information resource because they allow business organizations to use them properly manage all of their other resources.

Online analytical Processing - OLAP, OLAP cube called a set of data, actually a database, organized in a way that facilitates queries that are not pre-defined for

aggregating the information you need. OLAP is one of computational techniques and tools for the analysis of business data is often collectively referred to as Business Intelligence - BI.

Multidimensional structure analytical Online Processing - OLAP cube is defined as "a variation on the relational model that uses multidimensional structures to organize data and express the relationship between relational data." The structure is divided into separate "cubes" and the cubes are able to store and access data within the confines of each cube. "Each cell within a multidimensional structure contains aggregated data related to elements along each of its dimensions." Even when manipulating the data are allowed to access quickly, and they remained a compact database format. Data are still connected to each other.

Multidimensional structure is very popular for analytical databases that are used for online applications analytical Processing - OLAP [2]. Analytical databases use these databases because of their ability to deliver quick answers to complex business questions. Data can be viewed from different angles, which gives a much wider understanding and perception of the problem, in contrast to other available models [3].

II EIM - INFORMATION MANAGEMENT AT THE BUSINESS ORGANIZATION

Grown problems related to increasing demands in the decision-making has led to today's Enterprise Information Management - EIM, a special field of interest in the field of information technology. This new technology work is specialized in finding solutions for the optimal use of information within a business organization, in order, for example, to support business decision-making processes or operations that are taking place day-to-day, which require quick access to specific knowledge. The technology of work tries to overcome traditional barriers related information technologies present in information management at the business level. EIM process in his work combines Business Intelligence - BI processes and Enterprise Content Management - ECM. EIM "take" of these two approaches for the management of information and represents a step forward in terms of approaches to information management from the perspective of a business organization. In this approach to Business Intelligence - BI and Enterprise Content Management - ECM respectively manage both structured and unstructured information, provided that only EIM does not make the "technical" difference.

EIM is approached from the perspective of information management, IT strategy defined business organizations, on the basis of employees' needs for information. The technology of Enterprise Content Management - ECM and Business Intelligence - BI in that sense, approach chosen denomination, because they cover only part of the information within a business organization. This leads to a lack of available information during the decision-making processes, market analysis and definition of procedures.

A. Solutions

Beginning in 2010 the modern market is showing two different approaches EIM.

1. The first approach (and most widely used method) sets a special layer or level through the publication - Process Solutions Enterprise Content Management - ECM and Business Intelligence - BI. The rise of Microsoft SharePoint 2007 with the paradigm of workers in information caused a certain acceleration in the acceptance of these types of solutions. Workers who work daily on the information required direct access in both ways; data (structured approach) and content (unstructured approach), how many of them their role and responsibilities given appropriate rights to it. Solution through the portal offer opportunities to organize access to various information subsystems, including the authority to process management. Portal solutions also offer ways to work together on information products in the online environment, through various forms of cooperation. Processes can be organized and managed through: business process management and workflow through - workflow.
2. Second approach can be found in big rigs supplier of sophisticated software solutions that offer integrated solutions for Business Intelligence - BI, and the process of Enterprise Content Management - ECM. The current market is showing signs of great interest for the software platform and is moving in that direction, but although software manufacturers such as large commercial software organizations such as IBM, Oracle Corporation, Microsoft, SAP AG, EMC and OpenText progress, they still have a long way to the final solution. From their respective backgrounds (respective backgrounds), each supplier of software solutions covers only some parts of EIM portfolio, but in specific areas such as security, analytics and process management is still missing some important components. In all of this, Gartner is one of the major analytical business organizations, which pays special attention to the progress of EIM and software manufacturers in this field.

Some software organizations provide specific business applications for Enterprise Content

Management - ECM, such as document and image views (for example, leading-edge technology, Microsoft and Accusoft technology) and workflow (for example, Office Gemini, SpringCM and docAssist). In the market there are a number of business organizations that provide special features for managing Enterprise Content Management - ECM that can be used to improve the handling characteristics and functions of Enterprise Content Management - ECM. EIM software solutions tend to gain interest among customers as a strategy to overcome the current information silos or bulky traditional databases and resolving present a wide information overload (infoglut). This, the author wanted to comment on the "point" on a recent survey conducted business organization Gartner, related to EIM. The research that is conducted business organization Gartner provide clear guidelines as to the further development and evolution, and identify key strategies for overcoming known barriers identified.

III GARTNER BUSINESS ORGANIZATION AND TECHNOLOGY EIM MATURITY MODEL

Business organizations can not use EIM as a form of traditional project. Business organizations need to implement it as one continuous coordinated program that constantly evolves over time.

Business organization Gartner believes that in the information management maturity models, EIM will enable business organizations to identify which stage of ripeness they currently possess and what actions you should take to cross, and evolved to the next higher level of development.

1. Key Findings

- maturity model consists of six stages, or levels. The practice shows that in their work, businesses can not skip certain stages or related activities without causing the introduction of certain weaknesses or deficiencies in their programs EIM. Each skip will do to business organizations and their work fail in the later application of new technologies.
- Business organizations face in their work to risks and inefficiency as a result of poor information management, such as failure to comply with legal and regulatory requirements, customer dissatisfaction and lower labor productivity.
- Today, most of business organizations in the early stages of maturity EIM, so that leaders who advocate new ideas in their business organizations and later have the most benefit from early application of this model.

2. Recommendations

- It is a model of maturity make efforts as part of efforts to educate the highest level of quality management of business organizations so that

management understands the daily work of all phases of application for access to EIM technology work.

- To illustrate the risks of business, have defined that EIM, it is necessary to look at and analyze business examples where organizations have failed because of poor manage business information.
- It is necessary to create a scenario in business organizations, which illustrates the benefits expected to be achieved at each successive level of maturity models EIM technologies work.

3. Analysis

Many IT managers who are responsible for the management of information as a strategic asset, they want to know the necessary steps to achieve this goal. Before the start of the application of EIM technology, practitioners should first evaluate the ability and willingness of their business organizations to overcome the current practice of traditional information management and to overcome different, sometimes conflicting, bulky existing "silos" or databases of business information. Business organizations in the early stages of the implementation of EIM technologies often lack the ability to undertake projects that are needed in the later stages, such as master data management and metadata through their organization.

To help IT leaders in a qualitative way of assessing the status of their work or EIM technology to plan their day jobs (Journeys) EIM, business organization Gartner has created a model of maturity for the EIM, which consists of six phases. Descriptions of the six stages of maturity models should enable IT leaders to identify the level of maturity models which are currently in their businesses. The maturity model also indicates what actions should a business organization take in each phase, which is currently located, in order to pass to the next level of maturity models.

Desire to manage business information as a means (popular for many decades), is now getting renewed attention in the (executive suite). According to the surveys, business organizations, Gartner / Forbes in 2008, one of the highest priorities of senior management over the next five years will be the process of managing information as a strategic asset. Business organization Gartner has published extensive research on the management of business information within the organization. Further, the author provided a display of maturity models that lead to potential daily process of migration to a new, EIM technology work. In contrast to the current practice of information management (which tend to focus only on certain classes or certain business applications), EIM technology of an integrated approach to information management (with structured and unstructured content) consistently throughout the business organization.

EIM technology work manifests itself as a program with a defined budget, the right plan and resources. It requires continuous effort for the business

organization, which may take several years to achieve this in the right way. As such, EIM programs require a higher level of commitment, adequate sponsorship and support from the IT and business unit leaders.

4. Six-level maturity model EIM by Gartner

The U.S. company "Gartner" is from Stanford, state of Connecticut. It was founded in 1979 and employs over 5200 people and 1200 external consultants and researchers. Gartner operates in over 85 countries around the world engaging in research and advisory functions in the field of information technology. As part of its work, there is a section coled „Gartner grading“, providing an impartial comparison of IT performance in comparison to those organizations which are considered the best in its class. Gartner suggests that there is an urgent need to ensure that IT spending and investment (an average of 4% of total revenue) runs the entire business value and financial performance. Within that, among other things, „Gartner“ has developed a special „measure“ for determining the maturity model of EIM. [4]

Level 0: Unconscious need for EIM

At level 0, a business organization has a significant risk of not managing business information, such as vulnerability to failure, poor service and low labor productivity. Characteristics of level 0 are:

- Business managers and IT organizations do not know and do not feel that the problem of business information, while end users have confidence in the data used.
- Business organizations make strategic decisions without adequate information or with incomplete or problematic information.
- No formal architecture business information that includes the principles, requirements and models for guiding teams on how to share the business information on business organization.
- The information is often fragmented and inconsistent or inconsistent, processed through many different applications. Each department (department) independently saved or stored and managed their information and documents and work independently selected technology. No one recognizes the issues related to data quality as a potential problem or trying to reconcile potential conflicts or conflicts in the field.
- There is information management, security and responsibility required of key information funds. Information regarding the responsibilities are assigned on an ad hoc way, from project to project. Archiving and deleting (purging) of information or data that is used to maintain the system performance or to control costs. No one knows how the business organization spent on getting the necessary information.
- IT organization and the business units do not know why they are important metadatas.

Business organizations have adopted common general vocabularies and data models. Document management and workflow management (workflow) and the archiving process occurs through e - mail.

Action items: Planners and architects within business organizations should receive formal training in information technology and business leaders the necessary training on the potential value of the information management business organizations – EIM, and about possible dangers and risks if they have achieved such management, particularly with respect to legal matters and issues of compliance with regulations.

Level 1: Awareness of the need for EIM

At level 1, the business organization gets some initial awareness of the importance of information management. Characteristics of Level 1 are:

- Employees of the business organization realize the power of information and therefore develop strategies to collect personal projects and teaching. Disagreement about whose data is correct is still difficult to resolve. Employees complain that there is too much information and that there is not enough action-oriented to content. Employees want a consolidated view, but they can not get them out of their IT departments.
- Recently, growing awareness of the poor quality of the data, their fragmentation and inconsistency of information in key areas. Analytical applications generate huge stack of papers that are usually inconsistent or redundant, or a large number of redundant reports. No one in the business organization is not responsible for resolving these issues.
- IT department seeking its effectiveness in providing information to individual business units and normalize information "silos" through consolidation of databases, such as special storage Data Warehousing - DW. There are certain roles in the management of structured data (such as database administrators or administrators modelers), but not for unstructured content and electronic mail (e - mail).
- Staff recognize the need for a common or general standards, tools and models for wider use of skills and re-use of materials obtained from various projects.
- Efforts have begun to invest in order to document the risks associated with uncontrolled information systems (such as tables and independent audit database with extracted or estrahovanim data).
- Business organizations have defined informal information management policy, which applies only in isolated cases. Content and records

management occurs only when it is unavoidable.

Action items: Planners and architects within business organizations should formally introduce EIM technology strategy of the senior management of the business organization.

Strategy should show how technology aligns EIM work with other strategic business initiatives such as Enterprise Architecture - EA.

Level 2: Reactive

At Level 2, the business and IT leaders respond positively to demands for consistent, accurate and fast information to key business units. They take corrective measures to address the current, immediate need. Characteristics of Level 2 are:

- Business Units understand the value of business information and will therefore share with cross - functional projects. For now, no one sees the need to coordinate a wide information management organization. BMO lack of change management procedures to deal with the impact on downstream systems and business units when they occur upstream modifications.
- Business organization aims to formalize the exchange of business information to achieve operational efficiency, although present cultural and organizational barriers greatly hinder this progress.
- IT organizations have taken steps cross-department data sharing, such as Master Data Management - MDM, but do not recognize the need for an overall information architecture for connecting Master Data Management, related efforts, such as the processes and procedures within the Business Intelligence - BI.
- Integration still remains localized and often redundant or fully redundant, with widespread interfaces point to point. Business organization engaged in quality information only when problems become apparent. Local databases, a special type of data warehouse - DW are grouped into a single view for consistent analysis. IT organizations became aware of the importance of metadata, but do not run it in a strategic way. There is no content management strategies at the business organization's Enterprise Content Management - ECM.
- Metrics focuses on the expiration date information, files and other electronic forms to address the known risks of compliance. Other metrics show a disproportionate number of tables, bypassing the necessary controls within the Enterprise Resource Planning - ERP. Statistics show the redundancy of data are significant overlaps in the underlying data resources.

Action items: The main management business organizations should promote the need for EIM technology work through solving crossword - functionality (cross-functional), troubleshooting and adjustments. Planners and architects should prepare scenarios and business cases for EIM technology work.

Level 3: Proactive

At level 3, the organization recognizes the need for business to business information management as a necessary condition for better business and, therefore, exceed the level of project management information technology labor in EIM. Information supporting the optimization process. Characteristics of the third levels are[5]:

- Senior management business organization sees cruciate ligament functionality (cross-functional) business information exchange and sharing of information, as a way to adjust the size and wide initiative to promote businesses. Management appointed a high-level hierarchical sponsors to coordinate a comprehensive range of EIM technology and the future vision of communicating with each other. There is an initial budget, bylaws and roadmaps Communicate how the program will look further EIM technologies work.
- Enterprise Information Architecture - EIA act as guides for specific programs of work EIM technology, providing the information that is exchanged over the business organizations to actively support the business strategy of the business organization. Business organization sets its first standards for technology information management.
- Tips for managing and formal data quality program, with assigned supervisors data management business that helps organizations manage information as an asset. Key business units are actively involved. System development life cycle involves centered path data call to ensure and monitor that projects are implemented information architecture and information management standards.
- While still maintain the local, data models are aligned with the Enterprise Information Architecture - EIA. Different architectures for data analytics, basic data and unstructured content appearing together in logical level. The business organization is planned joined data service layer to deliver information as a service to new development styles, such as service-oriented architecture and software as a service.
- Professional organizations enforce policies for data archiving with precise retention period. It collects and organizes metadata for reuse.

Action items: Formally, the proposed business case for EIM technology work and prepared a presentation to explain the importance of case management and business organizations and other

interested parties on a daily basis. Business organizations use the possibilities of business units to identify EIM technologies work.

Level 4: Managing technology work with EIM

At level 4, the organization understands the business as an important information resource for critical operations. Business organizations have already implemented in practice, significant parts of EIM technology, including a consistent IT infrastructure. Characteristics of Level 4 are:

- Senior management business organization recognizes information as a strategic asset. It includes EIM technology work, and then market it takes communication. Business organization funded program EIM technology work dealing with key stakeholders and participants, and high priority requirements based on business strategy.
- Business Organization defines policies and standards to achieve the required consistency. Councils and boards of management (steering committees) address issues related to the problem of cross - functional information management. Identified best practices, and Enterprise Architecture - EA ensures that the practice spread throughout the business organization.
- Responsible Group coordinates all activities in information management throughout the business organization. Supervisors take responsibility for data quality data across business units and the IT organization.
- Policies and powers, or commands are documented and understood. Business organization has conducted several surveillance systems across the entire business organization, including data profiling and automated data quality.
- EIM technology becomes part of the process for planning, design and development of applications. Information architecture becomes different from the architecture of the application. Analytical and operational reporting blend will reduce the need for stand-alone analytical applications, tools, Business Intelligence - BI or some separate systems for Master Data Management. Business organizations manage data and metadata semantic inconsistencies resolved to support reuse and transparency.
- Perform an assessment model to guide IT investment information assets and merge. Identify metrics to increase productivity.

Action items: It takes a departmental inventory management activities, and information resources to connect them with the overall strategy of EIM technology. Business organizations require advertising EIM process technologies work as a unified program

rather than a series of individual projects. Creates a balanced report of the results obtained (Balanced Scorecard) for information management.

Level 5: Efficiency of EIM technology

At level 5, a business organization uses or exploits the information in the entire supply chain information, Service-Level Agreements - SLA that on an ongoing basis. Characteristics of Level 5 are:

- Senior management business organization now sees information as a competitive advantage and uses them, or exploit them to create new value and increase efficiency.
- IT organizations seek to manage information transparent to the end user, together with the supervisors of the business-level data which play a very active role. Information management business organizations - EIM is associated with strategic initiatives, such as the improvement of all business processes.
- EIM technology work actively supports the study of processes in order to improve productivity, manage compliance and reducing potential risks. Tracking and monitoring the implementation of the automated information management throughout the business organization.
- Business organization established group of EIM technology, either as a central department at the business or organization as a matrix organization. EIM Group working technology coordinates all efforts to manage information, such as systems for Master Data Management and Enterprise Content Management tools within Business Intelligence and other data services.
- Business organization reaches or achieves five basic goals of EIM technology as follows:
 1. Integrated master data domain;
 2. Seamless flow of information needed;
 3. Management of metadata and semantic data alignment;
 4. Data integration across the IT portfolio and
 5. Unique content.
- Focus on the metrics of external factors, such as sourcing, risk and profit margin. Reuse metrics show positive gains from trade, and sharing information.

Action items: It is necessary to implement technical controls and procedures to protect against complacency, because the information can be easily excellence "spoil" (break down) and if the business is partially changed.

The process of creating and developing an entirely new business models in all areas of business activity, is now largely based solely on information technologies.

Because state levels of the business organization Gartner regarding the migration of ERP systems on EIM systems as a future paradigm of business organizations put in the kind of environment our challenges. In other words, our managers should be intensive processes through additional training to fully master the possibilities available, information technologies and tap into the knowledge economy aiming at progress through the stages of maturity of information management.

IV CONCLUSION

Over the past decade, information technology has progressed rapidly, leading to a reduction of operating costs, thereby creating the conditions for developing and implementing easier data analysis in business organizations.

Because almost every activity that is carried out in a business organization is enabled, or is under the direct influence of information technology in one form or another, it is almost impossible to conduct internal audits without the use of information technology. Current auditing standards require the active use of reason analysis. Data collected and compiled by business organizations are, in essence, "electronic life blood" of the business organizations. Internal auditors should be required to be able to control or study and evaluate the overall "health" of the organization of business analysis and business intelligence data [1].

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Internet Management and its Application in Post Office

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Abstract - Modern business politics asks for continuous adjustment planning of the Post to the market changes. In order to survive and to be successful in today's business world of exceptional complexity and unpredictability, the Post must constantly use new technologies in business process. One of the most important modern technologies used in postal traffic is Internet technology that greatly improves postal business.

Usage of internet in marketing activities is very important for the Post, because it can directly influence on the business effectiveness and efficiency.

Making of management programs and market strategies in the Internet environment is a basis for future of the market-oriented operators.

The aim of this paper is to point out the importance of the Internet, which is crucial component of the economic structure of the modern world, as well as on the essence of management, which is basis, backbone of every organization and its efficiency as well as applicability in the Post from marketing point of view.

I. INTRODUCTION

The fact that the world is turned to market business made our society to turn from old-fashioned business policy to this kind of business. All the segments of world economy have undergone some changes that are consequence of global economy, technological changes and some other changes.

In the centre of these changes there are many organizations, which are very large and thus they are not capable to follow these changes. Postal organizations in many countries are in the same or similar position as the Post of Serbia. In current circumstances the Post was forced to implement appropriate measures in order to improve its professionalism and efficiency.

The biggest problems of our Post were in its organization. It was the first actions taken with the aim of improving its efficiency. All other measures, as well as this, were in the field of management. The Management includes all actions connected to the marketing, logistics, personnel and etc. Management is a function that consists of organization and coordination of all activities leading

to successful business. In order to achieve certain aim, efficient and profitable Post, it is necessary to implement some changes.

Postal system should base its business politics on market principles and management appliance with new concepts and methods in order to fulfill general social interests, customers' interests and company's interests.

II. POSSIBILITY OF APPLICATION MANAGEMENT POST ON THE INTERNET

Modern business management in the field is no longer possible to carry out without the use of information and communication technology. The application of Internet technology involves a radical change in management in strategies, plans, programs, communication.

Since the components of the various areas of management include: logistics, marketing, organization, quality management, human resources, technology and development, and others. it is necessary to carefully choose the appropriate Internet presence post in this medium. For use of the media it is important to know the essence of marketing, sales and advertising. It is necessary to have a good strategy (performance) on the electronic market, and that this approach gives the best results (TO-demand response) in terms of advertising products / services, communication with the respective agencies selling. Internet provides an interactive relationship between the parties offering the product / service and the seeking. Viewed as a concept, it enables the consumer to be in the spotlight, for the selection of products / services at their own stomachs, desires and abilities. Doing business on the Internet consists of several components:

- Globalization
- Business opportunities "small"
- Business Cooperation Development
- Internet Marketing

- Communication (internal ieksterna)
- Achieve and maintain a competitive advantage
- Creating a corporate image
- Sales
- Reduce costs.

As Internet users can be shown by individuals, companies, institutions (WLED, schools, colleges,) and ad hoc grope. Using the Internet they can provide the following: Searching and gathering information;

- Exchange of electronic mail (e-mail);
- Using databases of various organizations, individuals and the government;
- Search and retrieval software;
- Access to newsgroups;
- Submit and receiving files (classical, music and video);
- Product Search: public, university and research libraries);
- Searching and ordering expert magazine;
- Presentation and promotion of various types;
- Communicate in real time;
- Distribution electronic publications;
- Sales of goods and services.

Appropriate combinations of these activities provides opportunities for expanding existing business on the Internet, such as sales, customer support and research.

III. CONCEPT INTERNET MANAGEMENT

The concept of management on the Internet is a very complex matter and is reduced by the actions of a public international computer network of the Internet to bring about its simplification and greater efficiency. Management on the Internet, in fact, a set of activities that lead to improvements and success of the company (post), with all its good and bad sides. With the help of the media and the goals established in the strategic vision and mission, it becomes an instrument in the realization of their optimal dynamic business environment.

Management activities on the Internet, on the side of inclusion, can be classified into four functions:

- The function of communication,
- Sales function,
- Function of offering content,
- Function to create a network (networking).

The essential difference is the use of the Internet as a direct response to the gains offered solutions company and thus can be quickly and efficiently perform the correction. Interactive management based on the Internet, is a new form of relationship, or direct communication between the provider and the consumer, which is the basis of modern communication.

To get from users the appropriate response, the site must be properly designed. This means that the site must have the appropriate number of pages (not too much) - not to be confusing to the user, they are connected in a way that suits the company - to provide specific information, and will eventually, as a result receive the proper response to the user. The main question to ask is actually: "What are the appropriate answer users of the site?" The reaction that the company wants to achieve the required response is called CHP.

Required response-this is most important thing on the site. If no adequate TO, depending on what kind of site (commercial, news, ...), there is almost no point asking site.

Before you write the first word, before engineers come up with the concept and architecture of the site, the designers come up with its layout and graphics should ask that! When you put your company for IT products / services offered, every element of the site shall be designed so that it leads to. Each word should be written, every title, every picture set to help you get the required IT.

After talking about Internet management, there is a corresponding multitude of layers. First of all, the Post site, to offer information about services, then the new ones, which are both profitable and what would be the site visitor into a customer.

What Internet marketing stands out in comparison to the classic:

Interactive communication dimensions of modern marketing is mostly reflected in the following activities:

- Sales of goods and services
- Position companies and PR success
- Competitive analysis
- The success of the brand
- The reduction in costs
- Creating loyalty among consumers
- Creating leaders and quality staff
- Support business partners and finding new
- Improving distribution channels
- Expanding existing markets
- Testing of new markets and new products

When it comes to pure management needs, this refers to communication within the post - between the top and lower levels of management, as well as the exchange of knowledge and experience among managers who are in the same profession (post in Germany, England, Franc...).

Impact of Internet technology on top of the Post Office is strategically important because it allows specialization top management, while at the same time they released a series of operational activities and to

engage the broader creative activities. At the operational level, the best possible effect and the highest level of application of information technology. The lowest level managers have the greatest benefit in the areas of support, making and data processing.

A successful Internet strategy is based on planning and basic elements:

- Web marketing elements
- Element other Internet applications
- On-line/off-line strategy

To start the activities on the Internet are necessary strategies and plans, which define the objectives, scope, tactics, resources, etc..

The target group of consumers or users of the network must be established and activities such as new customers / existing products, new products / existing customers, providing service and support to customers.

The basis on which the Internet is based interactive communication strategy and databases. Establish communication company in the development of a consumer Web sites is an important component of this strategy. Database, which includes a Web site, can be viewed from two aspects. The first aspect relates to the use of database management in order to create content that will fill up the web page, and the second aspect is related to access data from existing databases.

A good strategy should be focused on two main objectives: to establish long-term relationships with stakeholders and generating profits for the company.

IV. SIGNIFICANCE INTRODUCTION OF THE INTERNET IN POST

Mail system - Telecommunications is one of the main generators of the overall development of the economy and society. From the efficiency of this system and its technical equipment and performance depend on the overall economy.

To survive and be successful in the current business world, he must change their business process using advanced information and telecommunications technologies. The most important new technologies that are applied to the postal service and whose introduction post significantly improved its business are: the Internet and other networks, direct marketing, hybrid mail, electronic data interchange, express mail service.

One of the strategic directions of development of the postal administration has developed Internet business system implementation in the existing business system. Internet Mail offers a great opportunity to make your business processes faster, cheaper and more successful. Relationships with customers and suppliers can also be improved using an Internet service. Proper use of Internet technologies in e-business opportunity offers of posts to

be more aggressive and penetrating the market, both domestic and foreign, which would be a whole new dimension to the services we offer our postal administrations.

Internet Mail application to meet the growing expectations and needs in terms of quality of postal services (faster, more reliable, user-oriented), the requirements for a lower price, the number of requests for electronic services. The most obvious advantage of the introduction of Internet technology to maintain the best possible relations with customers, vendors, employees and suppliers, creating interactive relationships with them. Using the capabilities of the Internet, the Post can innovate and improve the overall customer experience in all phases of their business, including how the process prior to the selection and purchase of products or services, and those processes after delivery of goods or performance of services.

To post to meet customer needs in terms of quality of services provided, as well as their diversity, it is necessary to modify the existing postal services, and the introduction of new services. New services arising from the Internet (electronic communication, electronic commerce, rapidly becoming, electronic money) allow the Post Office to respond to the current needs of consumers of postal services, market demands and increasing competition.

About the new services offered by PTT "Serbia", users can be informed via the internet, at www.posta.co.yu



Figure 1. The opening page (home page) JP PTT "Serbia"

Some of the new services that are presented on this website and that users can be informed are:

- **Ad post** - list issued PTT "Serbia", through advertising and comfortable shopping by mail. List not addressed is distributed as promotional material on the territory of the Republic, and enables users to make their messages, brochures, flyers and other promotional material accessible to the public through the buying of advertising space Ad in the mail, or by

sending various advertising materials as an integral part of the list.

- **Advertising in units of the postal network.**

The advantage of advertising in the Post Office is available to the rich and the infrastructure to enable direct access to a large number of users. The Serbian Post has more than 1,500 post office counter with about 4,000 a month through which passes 18 million users. Over 1000 of the poster is in the 161st post offices in 107 cities in Serbia.

- **Advertising via electronic displays** - a new promotional medium. Advertising messages to users of the service over 240 displays throughout Serbia are available to thousands of users daily through the Post Office of Serbia.

- **Post Shop** - Mail provides the ability for users to showcase their exclusive products in special glass display cases protected the busiest post offices in Serbia.

- **Internet catalog sales** - a service that will soon become Serbia offer manufacturers, retailers and other customers who want to present their products online to reach out to the grass roots of our customers. Web site offers a presentation <http://www.pt.shop.ptt.yu> allow users who are under contract to the products which are the subject of the Contract, deliver competent Mail depot packed in accordance with the content.

- **Mail with paid response** - The service is designed to senders and legal entities that send your catalogs, brochures, questionnaires, surveys and other promotional material to address a number of different counting on a big turnout.

- **Address code** - Providing information about the new way of addressing items.

- **Cash Express** - ordering the payment of money from the current account of the Post Office Savings Bank and its delivery to the appropriate address.

- Department 96 - Telephone reception of telegrams and forwarding them to the delivery post office.

- **E-referral Post Net** - Placement of information related to traffic Post Net orders - status, and other complaints.

- **Commercial SMS**

- **SMS balance on current account**

- **SMS prepaid loan with a checking account at PF**

- **Receive ads via SMS**

- **Internet SMS Recharge time the Internet service provider**

- **SMS ads – notification**

- **Financial services PTT "Serbia" provides individuals:** payment obligations, payments and payment orders, checks in payment of current accounts with banks, payment checks Serbian Bank ad, on line payment for prepaid mobile customers and others.

- **Financial services PTT "Serbia" provides legal persons:** the payment of daily receipts, remittances to individuals through postal money orders, billing and other individuals.

- **Financial services provided in the post and on behalf of the Postal Savings Bank:** Jobs for current accounts, cash withdrawals from banks, credit cards, services dinar savings, savings services, services, foreign currency accounts, purchase of foreign currency, the payment of international postal and telegraph order, WESTERN UNION payment remittances and others.

- **Money Transport** - Transport money with security, escorts and money laundering with Transport security and payment in the mail to the customer's account.

- **Automatic Vehicle Monitoring (APV)**

- **centralized alarm system (CAS)**

- **Cable Distribution System (KDS)**

- **Center for e Business Ceppi**, which allows the integration of multi-channel infrastructure and IT support activities and development services in the field of electronic business Post and external customers. Within CePP are the following sectors: customer service, voice machines, e-commerce, e-banking, digital certificates and the quality of the sector.



Figure 2. The opening page (home page) CePP

- **EMS (Express Mail Service)**, a new service designed for those who, because of their personal or business obligations do not have enough time to send your shipment from the nearest post office.

- **Express mail on the world market (common DHL - Mail)**

All shipments from receipt to delivery follow through defined control points. Customers in an instant shipment status information using the Internet at the website <http://www.dhl.com/> or on internal and international traffic on <http://www.trackandtrace.ptt.yu/>.

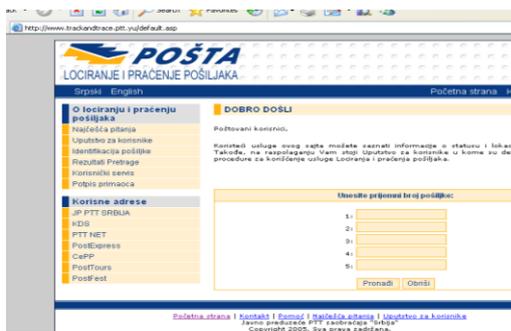


Figure 3. The opening page (home page) internal and international traffic

High-speed transmission of letter and parcel items provided EXPRESS POST. Delivery of packages in the Post Express is organized in three ways: Today for Immediate Service was organized in 26 cities, services for Today Today to transfer shipments in 12 cities and Services Today for Tomorrow from 161 seats to the whole of Serbia. Consignments are accepted at post offices and inviting call center when courier takes delivery directly from our shipper.



Figure 4. The opening page (home page) Post Express

Information about Internet-related services provided by the post can be found at www.ptt.rs.

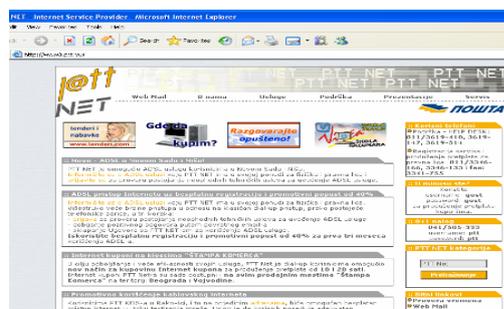


Figure 5. The opening page (home page) PTT.NET a

To post to mandatory managed Internet business system as much as possible implemented in the existing business system. Mail can not distinguish between the

quality of service offered to users on-line and traditional users.

The most important, and also the exclusive advantage of being totally control the process of delivery of purchased goods and services over the internet. Another significant advantage since the great financial and human resources of the company. Fasting is greatly facilitated entry into the electronic marketplace, it can be done quite simple allocation of funds and personnel to carry out the function for e-business.

Proper management and business experience, staff training necessary material resources and a greatly simplify the route to success in the market.

"Also, the Serbian PTT is considered as one of the best known companies in the country, a large number of potential users is true for the company you trust. Goal Post Office to justify the trust that part of the market and the proper conduct of business and the higher quality of services improve the image of the company all other users. use the Internet to improve your Mail and Midge "

V. Preconditions for implementation of Internet technologies in post

To post successfully implemented the Internet and other new technologies in the process of repositioning the Post, with the aim of creating an independent organization with well-defined legal status, financial independence and the ability to growing in terms of competition, and adapt to market needs. Structural reform of the postal system includes the processes of deregulation, globalization, modernization, liberalization, organizational, management, ownership, technical, technological and other transformations.

To start the process of transformation of the contemporary post basic prerequisite is adequate separation of the postal and telecommunications activities into separate business entities.

The process of separation of postal and telecommunication services in the country, was launched with the adoption of the Telecommunications Act (1996). This process was accompanied by the appropriate state policy in relation to postal activity. Inadequate guided government policy in relation to the post is through traditional postal business financing model, which was based on the depressed prices for postal services and water from income realized in the field of telecommunications, as well as through much of an interest in investing in telecommunications. The main goal is the creation of favorable conditions and space for the deregulation of postal services. Deregulation is the process of reducing the state's influence on the business of Post and liberalization process of introducing competition in the postal market. The implementation process deregulation, liberalization, organizational, ownership, management, and other transformations, the competent authorities should create an institutional environment that would allow the Post Office to adapt the

general strategy separate the major trends and harmonize regulations with the conclusions and recommendations of the (legislation) and SPS regulations EU . The level of federal and state authority, measures of economic policy in the field of postal services to certain laws, to regulate the relationship between fasting and the state. In this sense, it is proposed the adoption of three laws:

The Postal Act, which would form a corporation and status issues resolved

The Postal Services Act, which would establish a basic service and the conditions under which they are provided, and

Act postal concession, which would regulate the relations between the state and providers of basic services, as well as the postal market.

To postal activities closer to the market and the customer, it is necessary to ownership transformation post through corporation or privatization of the company by selling part or all of the companies, as well as organizational transformation that has to be directed towards the realization of the concept of marketing business. The new organization must be less hierarchical and more flexible structured.

Solving these problems, because it opens the way for the full implementation of the Internet and other technologies in their operations.

VI. CONCLUSION

The aim of theist paper was to establish applicability of the Internet technology in the Post management.

In order that the Post becomes part of the international Internet world, characterized by economy trends such as: deregulation, globalization, liberalization and new forms

of communication, the Post should base its business politics on market principles and marketing appliance with new concepts and methods as well as it should find the way to quickly adjust to dominant electronic type of business.

Usage of the Internet concept enables the Post to follow, analyse and respond to general trends of the world's postal market, to meet new challenges, needs and desires of the customers. Meeting the needs of the users is the basic factor of Postal efficiency on the market.

On current market the appliance of Internet concepts enables the Post to introduce new services with better quality whose aims are to meet market demands, to have better results, to lessen the costs, and to have optimal capacity development and so on. Market research show the needs, desires and possibilities of the users and all this leads to improvement of capacities, organization and offers on the market.

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Generalization of Hypercylindrical Function

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Abstract - In this paper are presented the results of theoretical researches of hypercylinder function on the basis of generalization of two known functions referring to hypercylinder $S(k,r)$ and hypervolume $V(k,r)$ of the hypercylinder and conjectured recurrent relation between them. In view of two introduced freedom degrees k and n is performed the generalization of these functions, so we have got a special continual function, i.e. a generalized hypercylinder function.

I. CYLINDRICAL AND HYPERCYLINDRICAL OBJECTS

A. An Introduction of cylindrical objects

Cylindrical bodies are known from the beginning of civilization. In the ancient Greece, China, Egypt and in the other places of its development, was thoroughly studied the cylinder phenomena. The greatest architect, nature, from times immemorial directed its geometry to cylindrical objects. Innumerable dendroid retain these characteristics from the most primitive evolutionary development to this day Archimedes (287 - 212 BC) studied with the exact – geometrical methods sphere and cylinder, noticing special regularities existing between them. From the standpoints of geometry and topology cylinder is a geometrical body whose characteristics are well-known. The cylinder axis can be inclined at some angle in relation to bases. Its height can differentiate from diameter. Such cylinder is the most common. Cylinder is normal if its basis and axis line are vertical one to another. Then its cross section on this line is of rectangular form, while the orthogonal section (concurrence) is in the circle form. Those are simultaneously also two key projections of cylinder, and they are not any more mutually identical as with cube (only squares) or balls (only circles).

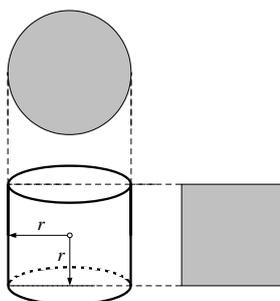


Fig. 1 Vertical cylinder of the equal height and diameter with two non-identical projections (right).

If we analyze the special case when the cylinder height is equal to diameter (Fig. 1), with differentiating solid-cylinder (of full object) on radius, we obtain surf-cylindrical objects (surface cylinder). In that case six framed geometrical cylinder entities are certainly mutually dependent (Fig. 2). This recurrence on the basis of the derivatives of the functions connected to cylinders can be the key connection for defining general hypercylindrical function. Characteristics cylinder entities accessible to the sensory perception with the column solid-cylinder (right) and surf-cylinder (left), are systematized in the next figure.

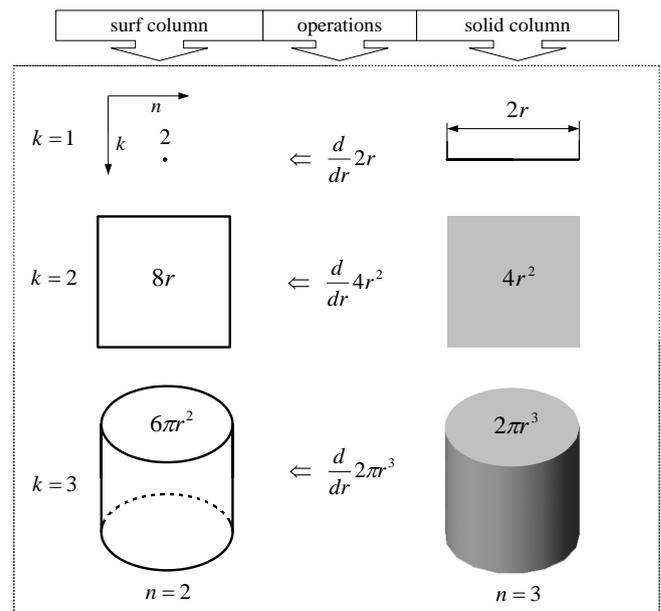


Fig. 2 Moving through the real surfaces vector (left): subtracting one freedom degree k from the surface cylinder, we obtain the square size, and for two (freedom degrees), the number 2. Motion through the real solids vector (right): subtracting one freedom degree k from the full cylinder, we get the full square, and for two (freedom degrees), the line segment- diameter

B. Suppositions connected to the hypercylindrical functions

The hypercylinder function is a hypothetical function connected to multidimensional space. It belongs to the group of special functions, so its testing is performed in view of the known functions of the gamma (Γ) type, psi (ψ_0), beta (B), and the like. The most significant value of this function is its generalizing from discretion to continuum. In addition,

we can from the field of natural integer values of dimensions (freedom degrees k and n), pass analytically on the set of real and non – integer values, and so there concur as well the conditions for its graphic interpretation and more concise multigeometrical analysis. To the development of the theory of hypercylindrical, hyperspherical, hypercubic and other H -functions, have contributed: Gohara and J. Nishikawa [2], Gwak, Lee B-H. and Lee W. [4], Hinton [5], Hocking and Young [6], Lee and Kim [7], Manning [11], Maunder [15], Neville [16], Rucker [17], Sommerville [19], Sun and Bowman [20], Young [21], Letic and Davidovic [9] and the others. Today the researches of the hypercylindrical function are represented both in Euclid’s and Riemann’s geometry (molecular dynamics, neural networks, hypercylindrical black holes and the like). The functions of the hypergeometrical objects are hypothetical functions connected with multidimensional geometry. In this part is performed the generalizing of the cylinder function in so – called hypercylinder as an unique form, and after that we can through matrix present special cases that make the family of hypercylindrical function. Hypercylinder, in other words the multidimensional cylinder, presents the generalizing of the three-dimensional cylinder that is defined on the basis of the

three dimensions X, Y, Z . In the case when the dimension is $k = 3$, this cylinder may be surface (surf) or cubic (solid), while $k > 3$ is multidimensional cylinder. This shorter analysis is not enough to explain the definition of the hypercylindrical object, taking into consideration that the information about it are considered from many aspects, as well with e.g. hypersphere or hypercube. That what mathematicians have exactly defined, is presented through formulas for even and odd dimensions (with the help of the freedom degree k). Naturally, these dimensions are discrete and integer (they are defined by factorial functions). Their generalizing is based on the *gamma* function characteristic that overcomes discretions between dimensions evenness and oddness, and simultaneously makes continuum between them, so that the dimensions do not have to have the value of only the natural numbers.

C. The surface and cube hypercylindrical functions

Theoretically are already defined the hypercylindrical functions and they refer to the hypercylindrical surface (surf) and hypercylindrical volume (solid) [22], [13]. So, there are:

TABLE I.

Dimensions (freedom degree)	Surface hypercylinder ($h \neq 2r$)	Volume hypercylinder
Even dimensions	$S_{2b} = \frac{2^{2b} \pi^{b-1} b! r^{2(b-1)}}{(2b)!} [(2b-1) + 2r]$	$V_{2b} = \frac{2^{2b} \pi^{b-1} b! r^{2b-1}}{(2b)!} h$
Odd dimensions	$S_{2b+1} = \frac{2\pi^b r^{2b-1}}{b!} (bh + r)$	$V_{2b+1} = \frac{\pi^b r^{2b}}{b!} h$
General dimensions	$S_k = \frac{\sqrt{\pi^{k-1}} r^{k-2}}{\Gamma((k+1)/2)} [(k-1)h + 2r]$	$V_k = \frac{\sqrt{\pi^{k-1}} r^{k-1}}{\Gamma((k+1)/2)} h$

where $\Gamma(z)$ is – the gamma function. When we analyse a special, simpler hypercylinder case, where its height is equal to diameter ($h = 2r$), then the previous formula

for the hypercylinder surface and hypercylinder volume, respectively give as it is in the table Table II, respectively Table III:

TABLE II.

Hypercylindrical surface ($h = 2r$)	Discrete form	Continual form
Even dimensions	$S_{2b} = \frac{2^{2b+1} \pi^{b-1} b! r^{2b-1}}{(2b-1)!}$	$S_{2b} = \frac{2^{2b+1} \pi^{b-1} r^{2b-1} \Gamma(b+1)}{\Gamma(2b)}$
Odd dimensions	$S_{2b+1} = \frac{2(1+2b)\pi^b r^{2b}}{b!}$	$S_{2b+1} = \frac{2(1+2b)\pi^b r^{2b}}{\Gamma(b+1)}$
General dimensions	$S_k = \frac{2k\sqrt{\pi^{k-1}} r^{k-1}}{(k-1/2)!}$	$S_k = \frac{2k\sqrt{\pi^{k-1}} r^{k-1}}{\Gamma((k+1)/2)}$

TABLE III.

Hypercylindrical volume ($h = 2r$)	Discrete form	Continual form
Even dimensions	$V_{2b} = \frac{2^{2b+1} \pi^{b-1} b! r^{2b}}{(2b)!}$	$V_{2b} = \frac{2^{2b+1} \pi^{b-1} r^{2b} \Gamma(b+1)}{\Gamma(2b+1)}$
Odd dimensions	$V_{2b+1} = \frac{2^{2b+1} \pi^b r^{2b}}{b!}$	$V_{2b+1} = \frac{2^{2b+1} \pi^b r^{2b}}{\Gamma(b+1)}$
General dimensions	$V_k = \frac{2\sqrt{\pi^{k-1}} r^k}{(k-1/2)!}$	$V_k = \frac{2\sqrt{\pi^{k-1}} r^k}{\Gamma(k+1/2)}$

II. THE HYPERCYLINDRICAL FUNCTION OF THE n^{th} FREEDOM DEGREE

A. The hypercylindrical function with one freedom degree

The expressions for hypersurface $S_k = \frac{2k\sqrt{\pi^{k-1}}r^{k-1}}{\Gamma((k+1)/2)}$ and

hyper volume $V_k = \frac{2\sqrt{\pi^{k-1}}r^k}{\Gamma((k+1)/2)}$ present the key basis for

making an unique form of the hypercylindrical function. The basis for that is one essential characteristic of the previous formulas, and it is that with the derivative of the hyper volume function on radius, we get the hypersurface function, provided that $h=2r$. The similar property is also characteristic for the hypersphere [24], [13], and on the assumption as well for the hypercube [12], [13]. Obviously that the hypercylinder surface for the radius r is now presented in the form:

$$S(k,r) = \frac{\partial}{\partial r} V(k,r) = \frac{\partial}{\partial r} \frac{2\sqrt{\pi^{k-1}}r^k}{\Gamma\left(\frac{k+1}{2}\right)} = \frac{2k\sqrt{\pi^{k-1}}r^{k-1}}{\Gamma\left(\frac{k+1}{2}\right)} \quad (2.1)$$

With some generalizings these expressions can generate the family of hypercylindrical functions, and their development would be preformed on “horizontal” dimensions or *freedom degrees* with the mark n , where is $n \in N$. In the frame of every “horizontal” freedom degree n exists also “vertical” or orthogonal freedom degree k (Fig. 2).

B. General form of the hypercylindrical function

The function $V(k,r)$ will be further designated with $HY(k,3,r)$ (Hypercylinder), where k - dimension is in the frame of 3rd freedom degree ($n=3$), and r hypercylinder radius. The general mark would be now presented with the function of three arguments, in the form $HY(k,n,r)$. With the hypercylinder of 3rd freedom degree, there is, as at stake, as it is noted, the volume. While with the hypercylinder of 2nd freedom degree is at stake the surface to which suits the function $HY(k,2,r)$. Well, in view of previous there are:

$$HY(k,3,r) = V(k,r) \quad \text{and} \quad HY(k,2,r) = S(k,r) \quad (2.2)$$

Passing on the higher function than the reference one - e.g. surface one, is done by integrating, so that the previous functional equation $HY(k,3,r)$ can be presented in the following form:

$$HY(k,3,r) = \int_0^r HY(k,2,r)dr = \frac{2\sqrt{\pi^{k-1}}r^k}{\Gamma\left(\frac{k+1}{2}\right)} \quad (2.3)$$

Freedom degree is here conditionally defined and presents the level of hypercylindrical entity dimensions. So, in the first freedom degree ($n=1$) is covered only length entity. In the second there is the surface one, and in the third is the volume entity. Higher freedom degrees are covered from 4th, 5th to the n^{th} degree. These concepts are precisely defined in topology and geometry, and in this paper are specially treated. For 4th *horizontal* freedom degree follows the hypercylindrical function of the form

$$HY(k,4,r) = \int_0^r HY(k,3,r)dr = \int_0^r \int_0^r HY(k,2,r)drdr = \frac{2\sqrt{\pi^{k-1}}r^{k+1}}{(k+1)\Gamma\left(\frac{k+1}{2}\right)} \quad (2.4)$$

For 5th freedom degree, it is equal:

$$HY(k,5,r) = \int_0^r HY(k,4,r)dr = \int_0^r \int_0^r \int_0^r HY(k,2,r)drdrdr = \frac{2\sqrt{\pi^{k-1}}r^{k+2}}{(k+1)(k+2)\Gamma\left(\frac{k+1}{2}\right)} \quad (2.5)$$

where is e.g. $HY(k,2,r)$ the hypercylindrical function of the second freedom degree. The integration procedure to higher freedom degrees would lead to the n^{th} hypercylindrical function and general value of the placed integral. This is also the way that in view of the recurrent relation we shall perform its generalization in the form

$$HY(k,n,r) = \int_0^r HY(k,n-1,r)dr \quad (2.6)$$

This result can be obtained in many equivalent ways, so that the final or *generalized form of the hypercylindrical function* is followed. Consequently:

Definition 2.1. The generalized hypercylindrical function is defined by equality $(k,n \in \mathfrak{R}, r \in N)$.

$$HY(k,n,r) = \frac{2\sqrt{\pi^{k-1}}r^{k+n-3}\Gamma(k+1)}{\Gamma(k+n-2)\Gamma\left(\frac{k+1}{2}\right)} \quad (2.7)$$

where $\Gamma(z)$ is the gamma function. Or with the equivalent form:

$$HY(k,n,r) = \frac{2^{k+1}\sqrt{\pi^{k-2}}r^{k+n-3}\Gamma\left(\frac{k}{2}+1\right)}{\Gamma(k+n-2)} \quad (2.8)$$

Concluding about general value of this integral is helped with the fact that:

$$\frac{k}{\prod_{i=0}^{n-3} (k+i)} = \frac{1}{(k+1)(k+2)\cdots(k+n-3)} = \frac{\Gamma(k+1)}{\Gamma(k+n-2)} = \frac{k}{(k)_{n-2}} \quad (2.9)$$

The previous functional equation can be presented as well with so-called Pachhammer’s symbols $(a)_x = \frac{\Gamma(a+x)}{\Gamma(a)}$ established on the quotient of the *gamma* function [1]. At the some time with the derivatives on the radius r , we can as well perform “motions” to the lower *freedom degrees*, starting from the n^{th} one, in view of the recurrent relations of the type:

$$\frac{\partial}{\partial r} HY(k,n,r) = HY(k,n-1,r) \quad \frac{\partial^n}{\partial r^n} HY(k,n,r) = HS(k,0,r) \quad (2.10)$$

The example of the derivation right shows that is achieved the first ($n=1$) freedom degree, and that is two levels under hyper volume, and one under the

hypersurface and it matches to hypersize of the hypercylinder.

TABLE IV.

Function	Freedom Degrees	Name
$HY(k,3,r)$	$k < 3$	Hypocylindrical solids
	$k = 3$	Cylindrical solid
	$k > 3$	Hypercylindrical solids

The column vector in Fig.4 refers to the hypercylindrical solids. HY solid with the freedom degree $k = n = 3$ refers to the cylindrical solid. In this column for $k < 3$ each primitive is named hypercylindrical solid. For $k > 3$ ($k \in \mathbb{Z}$) these objects are hypercylindrical objects. Well, the first hypercylindrical solid is square (or disk), while the another one is radius or line segment. Formally, they are solids (volumes) with reduced one, in other words two freedom degrees k . Specially for the integer values, these objects are named primitives. The similar partition refers as well to the freedom degree $n = 2$, that refers to the surface cylindrical objects (left column).

III. THE MATRIX FORM OF THE HYPERCYLINDRICAL FUNCTION

A. The submatrix of the hypercylindrical functions

Taking into consideration that the hypercylindrical function is two-dimensional (leaving reserve to the radius r , as the third dimension), and that its values change depending on the freedom degrees numbers n and k ($k = 0, 1, 2, 3, \dots$ and $n = 0, 1, 2, 3, \dots$), it is assumed that these functions can be in the discrete form presented with the following matrix M_{kxn} . For example for two adjoining columns of this matrix $[M]^{<n-1>} = \frac{\partial}{\partial r} [M]^{<n>}$ follows the relation

$$[M]^{<n-1>} = \frac{\partial}{\partial r} [M]^{<n>} = \begin{bmatrix} \frac{2r^{n-3}}{\pi\Gamma(n-2)} \\ \frac{2r^{n-2}}{\Gamma(n-1)} \\ \frac{8r^{n-1}}{\Gamma(n)} \\ \frac{12\pi r^n}{\Gamma(n+1)} \\ \vdots \\ \frac{2\sqrt{\pi^{k-1}} r^{k+n-3} \Gamma(k+1)}{\Gamma(k+n-2)\Gamma\left(\frac{k+1}{2}\right)} \end{bmatrix} = \begin{bmatrix} \frac{2r^{n-4}}{\pi\Gamma(n-3)} \\ \frac{2r^{n-3}}{\Gamma(n-2)} \\ \frac{8r^{n-2}}{\Gamma(n-1)} \\ \frac{12\pi r^{n-1}}{\Gamma(n)} \\ \vdots \\ \frac{2\sqrt{\pi^{k-1}} r^{k+n-4} \Gamma(k+1)}{\Gamma(k+n-3)\Gamma\left(\frac{k+1}{2}\right)} \end{bmatrix} \quad (3.2)$$

Interesting results can be obtained in view of horizontal (n) or vertical (k) freedom degrees. So, for example it follows that

$$\frac{2k\sqrt{\pi^{k-1}} r^{k-1}}{\Gamma\left(\frac{k+1}{2}\right)} \Big|_{k=3} \vee \frac{8r^n}{\Gamma(n)} \Big|_{n=2} \vee \frac{2\sqrt{\pi^{k-1}} r^{k+n-3} \Gamma(k+1)}{\Gamma(k+n-2)\Gamma\left(\frac{k+1}{2}\right)} \Big|_{k=3 \wedge n=2} \Rightarrow 6\pi r^2 \quad (3.3)$$

or volume level:

$$\frac{2\sqrt{\pi^{k-1}} r^k}{\Gamma\left(\frac{k+1}{2}\right)} \Big|_{k=3} \vee \frac{12\pi r^n}{\Gamma(n+1)} \Big|_{n=3} \vee \frac{2\sqrt{\pi^{k-1}} r^{k+n-3} \Gamma(k+1)}{\Gamma(k+n-2)\Gamma\left(\frac{k+1}{2}\right)} \Big|_{k=3 \wedge n=3} \Rightarrow 2\pi r^3 \quad (3.4)$$

Thus this property is interesting because it can lead to the same result in view of two special formulas, or using only one, general. On the basis of the general formula (1.7) and the matrix M_{kxn} ($k, n \in \mathbb{N}$) (2.6) follow concrete values for the selected submatrix 11×12 ($k = -4, -3, \dots, 4$; $n = -1, 0, 1, \dots, 7$).

B. The hypercylindrical function gradient

Gradient can be defined for the hypercylindrical function, taking into consideration its differentiability. As this function contains the independent variables: k , n and r , follows the solution of the gradient functions $\nabla_{k,n,r}$ in the vector form:

$$\nabla_{k,n,r}\{HY(k,n,r)\} = \begin{bmatrix} \frac{\partial}{\partial k} HY(k,n,r) \\ \frac{\partial}{\partial n} HY(k,n,r) \\ \frac{\partial}{\partial r} HY(k,n,r) \end{bmatrix} = \begin{bmatrix} \ln 2r\sqrt{\pi} + \frac{1}{2}\psi_0\left(\frac{k}{2}+1\right) - \psi_0(k+n-2) \\ \ln r - \psi_0(k+n-2) \\ \frac{1}{r}(k+n-3) \end{bmatrix} \quad (3.5)$$

This function has special meaning with establishing the extreme of the contour HY functions.

$$M[HY]_{kxn} = \quad (3.6)$$

-1	0	1	2	3	4	5	6	7	n/k
$\frac{1260}{\pi^3 r^8}$	$-\frac{180}{\pi^3 r^7}$	$\frac{30}{\pi^3 r^6}$	$-\frac{6}{\pi^3 r^5}$	$\frac{3}{2\pi^3 r^4}$	$-\frac{1}{2\pi^3 r^3}$	$\frac{1}{4\pi^3 r^2}$	$-\frac{1}{4\pi^3 r}$	undef.	-4
0	0	0	0	0	0	0	$-\frac{1}{2\pi^2}$	$-\frac{r}{2\pi^2}$	-3
$-\frac{120}{\pi^2 r^6}$	$\frac{24}{\pi^2 r^5}$	$-\frac{6}{\pi^2 r^4}$	$\frac{2}{\pi^2 r^3}$	$-\frac{1}{\pi^2 r^2}$	$\frac{1}{\pi^2 r}$	undef.	undef.	undef.	-2
0	0	0	0	0	$\frac{1}{\pi}$	$\frac{r}{2\pi}$	$\frac{r^2}{2\pi}$	$\frac{r^3}{6\pi}$	-1
0	0	0	0	$\frac{2}{\pi}$	$\frac{2r}{\pi}$	$\frac{r^2}{\pi}$	$\frac{r^3}{3\pi}$	$\frac{r^4}{12\pi}$	0
0	0	0	2	2r	r^2	$\frac{r^3}{3}$	$\frac{r^4}{12}$	$\frac{r^5}{60}$	1
0	0	8	8r	4r ²	$\frac{4r^3}{3}$	$\frac{r^4}{3}$	$\frac{r^5}{15}$	$\frac{r^6}{90}$	2
0	12π	12πr	6π ²	2π ³	$\frac{\pi r^4}{2}$	$\frac{\pi r^5}{10}$	$\frac{\pi r^6}{60}$	$\frac{\pi r^7}{420}$	3
64π	64πr	32πr ²	$\frac{32\pi r^3}{3}$	$\frac{8\pi r^4}{3}$	$\frac{8\pi r^5}{15}$	$\frac{4\pi r^6}{45}$	$\frac{4\pi r^7}{315}$	$\frac{\pi r^8}{630}$	4
$k \in N$									$n \in N$

Fig. 3 The submatrix $HY(k, n, r)$ of the function that covers one area of

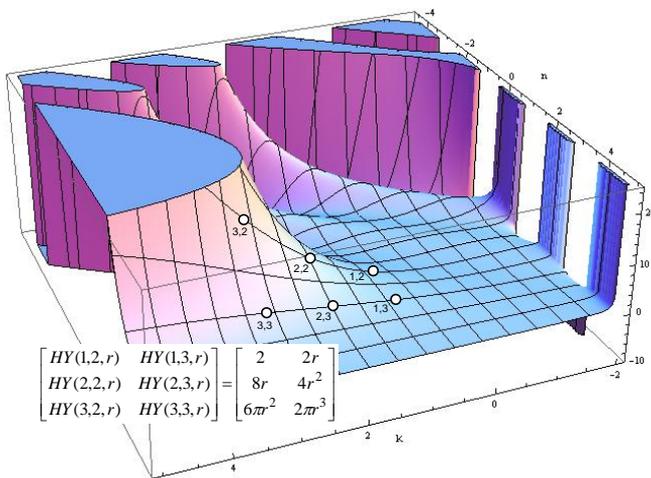


Fig. 4 3D hypercylindrical function for the unit radius $HY(-2 \leq k \leq 5, -9/2 \leq n \leq 5, 1)$ and the coordinates of the real cylindrical entities ($k, n \in \mathfrak{R}$)

IV. CONCLUSION

Hypercylinders present one part of the multigeometrical objects. Researching the hypercylindrical functions, there are at stake the next extensions: of continual dimensions that include noninteger values, of zero dimensions, of domain dimensions less than zero, consequently the area of complex freedom degrees and the like. Theoretically they exist, and the generalization achieved with this work refers to the generality in phenomena which we can find in multidimensional geometry and topology. In any case, the matrix of complex dimensions demands special structuring and deeper mathematical analysis. In the introduction was stated that sphere is the most symmetric geometric body. Some more bodies have such characteristic, but not in full. Namely, cube is symmetrical on orthogonal coordinates and in that case it is because of orthogonal retained the property that its functions derivatives of solid-entities (on half axis) make surf-entity functions (4.1 - right).

real freedom degrees ($k, n \in \mathfrak{R}$). Noticeable are as well coordinates of six characteristics cylindrical functions (undef. are undefined, most often singular values $\pm \infty$, while 0 are zeros of this function)

C. The Surface Graphics of the Hypercylindrical Function

The graphic of $HS(k, n, r)$ function can be presented for the field of real numbers, including both freedom degrees, and adopting radius as a parameter. Graphic generating is performed with the program package Mathematica. In the domain $k, n \in N$ and with the unit radius, the function is convergent. In the other three quadrants of the coordinate system, the oscillations are characteristic, the appearance of zeros and function singularities $HY(k, n, 1)$ (Fig. 5), so it is demanding for analytical testing. The same characteristics are as well noticeable on the presented matrix (Fig. 3).

$$\text{sphere: } \frac{d}{dr} \begin{bmatrix} 2r \\ \pi r^2 \\ \frac{4}{3}r^3 \end{bmatrix} = \begin{bmatrix} 2 \\ 2\pi r \\ 4r^2 \end{bmatrix}, \quad \text{cube: } \frac{d}{dr} \begin{bmatrix} 2r \\ 4r^2 \\ 8r^3 \end{bmatrix} = \begin{bmatrix} 2 \\ 8r \\ 24r^2 \end{bmatrix} \tag{4.1}$$

cylinder symmetrically is twofold and is not more unambiguous on all coordinate axes as with sphere. These properties are the essential suppositions for defining the recurrent relations that would give the connections among functions of some entities and on columns, in other words, series of hypercylindrical matrix. The considered analysis of the multidimensional space and formulas of this geometry leads to the conclusion of its complexity and the connections with the special functions and the other mathematical areas.

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Immunological Algorithms and Implementation

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Abstract – The paper gives a global review of artificial immune systems in computer sciences and their implementation. The performance of this algorithm in solving a practical problem is analyzed using Optimization Algorithm Toolkit, with special emphasis on determining the impact of parameter values.

I. INTRODUCTION

Man, similar to other living organisms, is constantly exposed to a wide range of micro-organisms such as bacteria, viruses, parasites and other harmful molecules (called antigens) that could damage one's body. Fortunately, it rarely happens, because man possesses immune system. The immune system is a very complex defense system that is composed of different cells (B and T lymphocytes) that prevent foreign objects of damaging the body. The T-cell is a special type of white blood cell that is of key importance to the immune system. It has so called T-cell receptors on its surface with which it can detect antigens. Normally, the receptors of a T-cell do not match the body's own substances. B-cell is a type of white blood cell and, specifically a type of lymphocyte. The B-cell is an immunological important cell.

In the context of the above, it is possible to formulate a definition of clone. A clone is a propagating population of organisms, either single cell or multicellular, derived from a single progenitor cell. Such organisms should be genetically identical, though mutation events may abrogate this [14].

Each body has its innate immune system. This system has a major role in the development of a complete immune system. Namely, over the years as the body is attacked by certain antigens, the immune system does not just have the goal of destroying these antigens, but also to memorize them. It has the important property of pattern recognition that may be used to make a difference between outer cells entering the body (antigens) and the body cells. Immune systems have several crucial characteristics such as uniqueness, autonomous, memorizing and recognition of foreigners, distributed detection and noise tolerance [1].

Artificial Immune Systems (AIS) are adaptive systems, inspired by theoretical immunology and observed immune functions, principles and models, which are applied to problem solving [2]. The general principle of functioning of the immune algorithm is presented in the following figure.

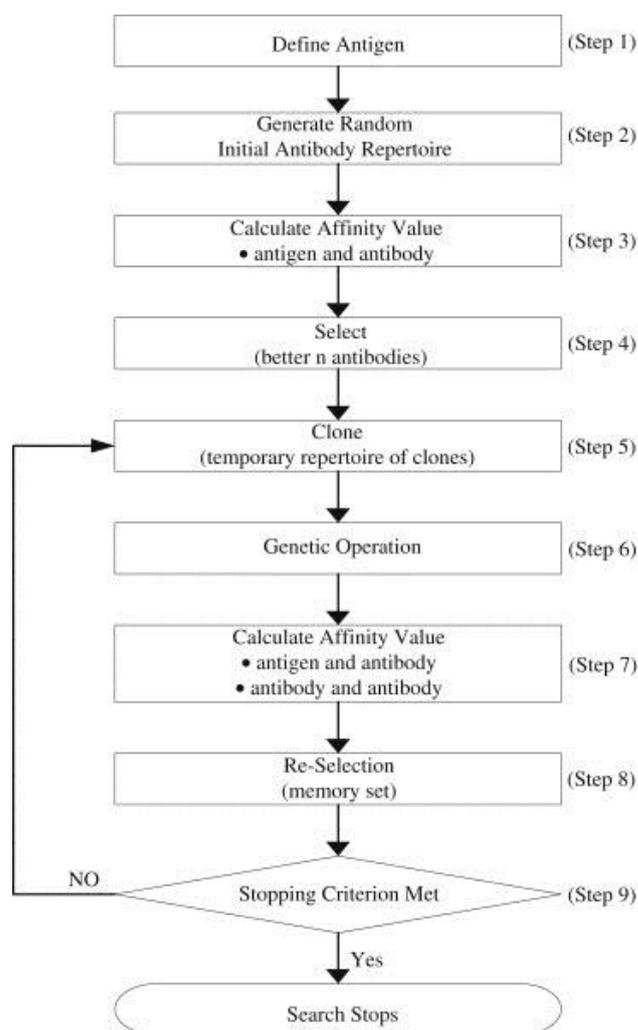


Figure 1. Flowchart of the immune algorithm [13]

The research of the artificial immune system began in the 1990s and until now a significant number of algorithms that have different applications. Algorithms can be divided, according to the functioning principle of the used immune system in four categories: negative selection, clonal selection, immune network algorithm and dendritic cell.

Negative Selection Algorithm – This type of algorithm is inspired by the mechanism in the thymus that generates a set of mature T-cells capable of binding only non-self antigens. Thymus is a lymphoid organ situated in the

center of the upper chest just behind the sternum (breastbone). It is in the thymus that lymphocytes mature, multiply and become T-cells. The first negative selection algorithm was proposed by Forrest et al [3] with the aim of detecting data manipulation caused by a virus in a computer system. The first task of this algorithm is to produce a set of self strings, which characterize the normal state of the system. The next task is to generate detectors, which only bind / recognize the complement of self strings. These detectors are then applied to new data in order to classify them as being self or non-self, indicating the situation that data has been manipulated [6].

Clonal Selection Algorithm - The clonal selection approach has been used as an inspiration for the development of AIS that performs optimization and pattern recognition tasks. The idea has been taken from the antigen driven affinity maturation process of B-cells, with its associated hypermutation mechanism [6]. These AIS also utilize the concept of memory cells to retain good solutions to the problem being solved. In [2], two important features of affinity maturation in B-cells are highlighted. The first one is that the proliferation of B-cells is proportional to the affinity of the antigen that binds it, thus the higher the affinity, the more clones are produced. In addition, the mutations suffered by the antibody of a B-cell are inversely proportional to the affinity of the antigen it binds. Applying these two features, de Castro and Von Zuben [9] developed a frequently used clonal selection based AIS (CLONALG), which has been used to perform the tasks of pattern matching and multi-modal function optimization.

Immune Network Algorithms - Jerne [4] proposed an immune network theory to help explain some of the observed important features of the immune system (learning and memory). The essence of immune network theory is that any lymphocyte receptor within an organism can be recognized by a subset of the total number of receptors. The receptors of this recognizing set have their own recognizing set and so on, creating an immune network of interactions [6]. Immune networks are often referred to as idiotypic networks. In the absence of a foreign antigen, Jerne concluded that the immune system must display a behavior or activity resulting from interactions with itself and from these interactions immunological behavior such as tolerance and memory emerge.

Dendritic Cell Algorithms - Matzinger [5] formulated the danger theory, which became widely accepted amongst immunologists as an explanation for the development of peripheral tolerance (tolerance to agents outside of the host). This theory considers that antigen – presenting cells (APC) are themselves activated by signals of danger. These activated APCs are then able to provide the necessary co-stimulatory signal to the T helper cells that subsequently control the adaptive immune response [6]. The danger signals are emitted by ordinary cells of the body that have been injured due to an attack by pathogen.

II. IMPLEMENTATION OF ARTIFICIAL IMMUNE SYSTEMS

Using historical chronology of research and existing division of applications [7], the basic implementations of

artificial immune systems can be classified into the following main areas and sub-areas [8]:

A. Anomaly Detection

- Fault detection
- Computer and network security
- Virus detection and spam

Recognition and detection of anomalies in data, usually in groups of measurements, include discriminative analysis, error estimation, feature extraction, grammatical inference, image analysis, sign recognition, speech recognition and identification mechanisms. Applications are very diverse and range from the recognition of spectrum reactants in chemical analysis, prediction of infectious diseases and analysis of medical data. The area of detecting anomalies in time data is based on the detection of new or unexpected patterns. Applications also exist in the area of early detection of potential hardware failures such as detection of temperature fluctuations in refrigeration systems, detection of defects in the plane and self-service ATMs. Fault diagnostic of software and hardware is extended to distributed systems such as sensor networks and nodes of mobile ad-hoc networks, where it can affect the flexibility of wireless sensor networks as well as routing in the wireless network nodes.

B. Machine Learning

- Clustering and classification
- Robotics
- Pattern recognition
- Control (planning)

The Domain of machine learning is very general and includes various forms of pattern recognition, conceptual learning, controlled and uncontrolled learning, clustering and classification data. The earliest applications were in the area of unmonitored learning to identify clusters of data while further implementations are in the area of supervised learning in systems with limited resource classifiers, the model of immune network for clustering and filtering unmarked sets of numerical data, adaptivity of intelligent systems and conceptual learning.

In the field of robotics, there are several directions of implementation of artificial immune systems, which can generally be divided into collective management of robot groups and adaptive management of individual robot.

The Domain of control also contains examples of artificial immune systems in processes of adaptive, sequential and feedback control, applicable in manufacturing systems, planning tasks and workflow, process planning and planning of software and hardware support.

C. Optimizations

- Optimization of numerical functions
- Combinatorial optimization

Numerous algorithms are developed in this area, mainly based on the principle of clonal selection. For example, clonal selection algorithm CLONALG, immunological network optimization opt-Ainet, an algorithm with the B-cells and immune optimization algorithm opt-IA. The popular and often exploited algorithm CLONALG to display elements uses binary

strings, implements affinity maturation and is also suitable for pattern recognition. The application of these algorithms and systems is explained in a series of papers involving numerical optimization functions, multi-target optimization, optimization of multimodal functions, combinatorial and time-independent optimization, which offer a range of solutions in the field of route management, planning tasks, storage optimization and solutions of the travelling salesman problem. The Clonal algorithm and the algorithm with B-cells are applied to the optimization of dynamic function, which is analogous to the task of the human immune system.

D. Other Implementation Areas

- Computational immunology
- Data and Web mining

One of the applications of AIS is computer immunology and the area of bio-informatics and immunoinformatics, where the first computer simulations of immune networks have evolved into modern stochastic models of immune system, which do not necessarily use immune network and are used for educational and scientific purposes. Although this area is often related to the problem of clustering, further research develops in different directions, from the study of evolution of antibody libraries to the behavior of ecosystems.

The area of data mining which involves classification and anomaly detection covers a wide spectrum of applications from data and Web mining, but also different applications such as the detection of fraud in financial systems, detection of potential customers, discovering disjunctive rules, data filtering, computer supported cooperative work and information processing.

III. EXAMPLE - OPTIMIZATION

In mathematics, statistics, empirical sciences, computer science, mathematical optimization is the selection of a best element (with regard to some criteria) from some set of available alternatives [10]. An optimization problem involves finding the minimum and maximum of a real function by systematically changing input values from within a pre-defined set and calculating the corresponding values of the function. More generally, optimization includes finding extreme values of some objective function given a defined domain, including a variety of different types of objective functions and different types of domains.

The optimization problem (route management) - Given a collection of cities and the cost of travel between each pair of them, the Traveling Salesman Problem (TSP) is to find the shortest possible route that visits each city exactly once and returns to the city of origin. In the standard version of this problem, the travel costs are symmetric in the sense that traveling from city X to city Y costs just as much as traveling from Y to X. A problem in graph theory requiring the most efficient (the least total distance) Hamiltonian cycle a salesman can take through each of city. No general method of solution is known and the problem is NP (nondeterministic polynomial)-hard.

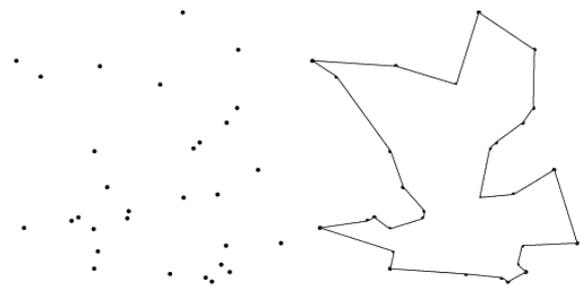


Figure 2. Traveling salesman problem - illustration

The simplicity of the statement of the problem is ostensible. The TSP is one of the most intensely studied problems in computational mathematics and yet no effective solution method is known for the general case [11]. It is also used as a benchmark for many optimization methods.

Optimization environment – The Optimization Algorithm Toolkit (OAT) is a workbench and toolkit for developing, evaluating and experimenting with classical and state-of-the-art optimization algorithms on standard benchmark problem domains [12]. The software includes reference algorithm implementations, graphing, visualizations and much more. OAT provides a functional library for investigating existing algorithms and problems, as well as defining new problems and algorithms. The graphical user interface provides easy access for configuring and visualizing existing techniques on standard benchmark problem instances.

CLONALG – Using OAT as a working environment, in the practical part of the paper the testing of immune algorithm in solving the TSP will be carried out. The basic principle of operation of CLONALG algorithm is shown in the following figure.

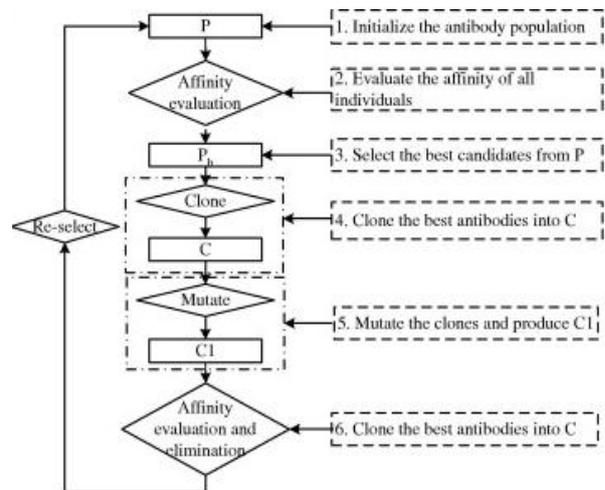


Figure 3. Steps of clonal selection method [15]

As shown in the figure above, clonal selection algorithm contains three basic parameters:

- antibody population size
- clone factor
- mutate factor

The aim of this paper is using OAT environment, to examine the influence of these parameters on accuracy in determining the optimal tour and speed of calculations. In this sense, the ability to configure the algorithm will be used, as shown in the figure below.

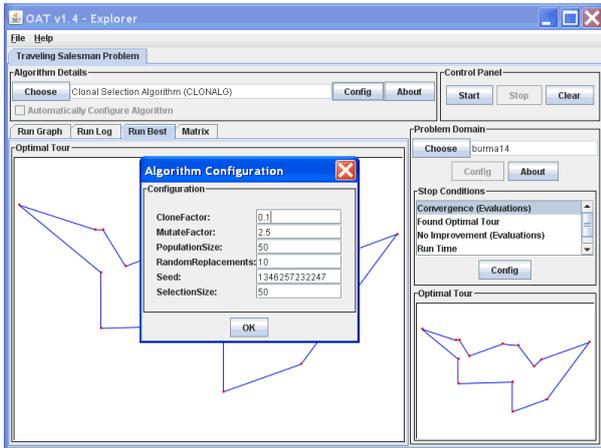


Figure 4. CLONALG algorithm configuration

The influence of analyzed parameters is given in the following table.

TABLE I. INFLUENCE OF PARAMETERS

Population size	30	40	50	60	70
Solving time (sec)	95	1	80	2	20

Clone factor	0.1	0.2	0.3	0.4	0.5
Solving time (sec)	83	1	3	1	10

Mutate factor	2	2.5	3	3.5	4
Solving time (sec)	< 1	80	< 1	420	170

IV. CONCLUSION

The practical part of the paper is focused on examining the impact of the algorithm parameters on time needed to determine the optimal tour. In all of the analyzed cases, the algorithm has led to the optimal solution, only the spent times were different for different parameter values.

In this sense, the existence of multiple optimal values was found. This practically means that the selection of parameter values should be careful (it is not to be disregarded which values are applied) and the behavior of the algorithm in practice is important to test with several different parameters.

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Types of Evolving Software Systems: A Short Review and Samples from Practice

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Abstract - Software evolution is a basic property of any software system. It refers to continuous changes of characteristics and behavior of a software system during the whole life cycle. In practice, software systems do not change in the same manner. Some software systems can be changed easily, while others were not built in the ways that facilitate changes. Lehman identified characteristics and proposed laws of software evolution. Based on that, Lehman identified three types of software systems and proposed SPE taxonomy of evolving software systems. In this paper are outlined these three types of software systems with some comments related to software systems recently developed as the results of projects implemented at Technical faculty “Mihajlo Pupin” in Zrenjanin at Information technology department since 2008.

I. INTRODUCTION

Changes are inevitable in software products life cycle [1]. The change is not always the consequence of bad software development practice. Various reasons exist for software changes after its delivery to customers. These reasons are:

- Changes in the law and regulative,
- Changes in business policies in a company that uses a software product,
- Performance improvement,
- Adaptation to changes in the technical environment where software is used (introduction of new technologies, or migration to another platform).

Appropriate performance and the quality cannot be always fully achieved during software development. Instead, they are achieved step-by-step through evolutionary changes after software product delivery [2]. According to Mittermeir [3], the main triggers of software evolution during the software life cycle can be divided in two groups:

- Market factors or various social phenomena,
- Technical and technological factors.

In practice, software evolution and maintenance can be seen as an aggregation of individual changes that are realized in software products during their life cycles [4]. Regarding organizational settings where software is used,

software evolution, together with software maintenance, plays the crucial role in establishing and maintaining an efficient business infrastructure. This is the consequence of the fact that software is closely connected with hardware and communication infrastructure, and the whole organization [5]. Felici developed the taxonomy of evolution that points out different dependability aspects of computer-based systems [6]. These aspects are presented as the evolutionary space:

- *Software Evolution*. It takes account of evolution from a product viewpoint.
- *Architecture (Design) Evolution*. It describes how evolution is perceived at the design level.
- *Requirements Evolution*. It represents an intermediate viewpoint. Requirements are used as a means of interaction between stakeholders. Therefore, requirements represent a natural place where to capture information about the evolution of computer-based systems.
- *Computer-based System Evolution*. It takes into account a systemic viewpoint that emphasizes human factors with respect to evolution.
- *Organization Evolution*. It emphasizes the interaction between the computer-based system and the surrounding environment.

II. PRINCIPLES OF SOFTWARE EVOLUTION

Evolution is a phenomenon that exists in many different domains such as society, theories, ideas, etc. Evolution refers to the continuous and progressive changes, preferably useful, of entity attributes. In practice, evolution can be seen as a set of continual changes that leads to the change in behavior and characteristics of the observed entity.

The concept of software evolution was recognized and defined by Lehman during his research in 1960. Initially, software evolution was considered as continual growth of programs that was related to functional characteristics improvement. Evolution was considered in terms such as increasing the number of program modules, lines of code or requirements for storage [2][7]. The first law of software evolution formulated in 1974 by Lehman, called *Continuing Change* states: “a large program that is used

undergoes continuing change or becomes progressively less useful" [7]. A standard definition of term software evolution still lacks, but some researchers and practitioners use it as a preferable substitute for maintenance [8].

Software evolution is today fundamentally connected with the use of computers and technical systems where software systems are integrated. Software evolution leads to creation of new characteristics or improvement of existing characteristics of software systems [9]. In practice, software evolution outlines the dynamics of maintenance during the software life cycle. This includes both development and maintenance phase of a life cycle. Here is maintenance phase related to phase that starts after initial deployment of software system in client's environment. Evolution is especially important for software systems with long life cycle, which further includes a large number of various changes with different reasons.

According to Cook et al. two basic approaches in researching software evolution are [10]:

- *Explanations:* It is concerned with understanding the roots, process and effects of the evolution. This approach is comprehensive and includes the impact of software evolution on the organization efficiency and planning of organizational changes.
- *Improvements:* It is related to development of more efficient and reliable methods and tools as a support to software evolution. It includes many areas of software engineering, such as design, maintenance, reengineering etc.

Perry suggested a comprehensive approach to software evolution that enables the deeper understanding of the evolution itself, as well as the evolution management [11]. This approach is based on the following dimensions of the context where the evolution occurs:

- *System relevant domains:* Changes in domains often require appropriate changes in software systems.
- *Experience gained during software development and evolution:* Experience is the main evolution driver because it influences understanding of software systems during development and usage.
- *Processes used in software development and evolution:* Process understanding is based on experience and usage of methods, techniques, tools and technologies that were used in development and evolution.

Software evolution has been investigated in the literature from various aspects: evolution process, the usage of repositories for version management (*Concurrent Versions System - CVS* <http://www.cvshome.org>, and *Subversion* <http://subversion.tigris.org>), the usage of systems for defect tracking (*Bugzilla* <http://www.bugzilla.org>) for analyzing various aspects of change, evolution of open source software (GNOME, KDE, Apache and sendmail), large systems evolution visualization based on problem or

modification reports, evolution of software product lines, and understanding of factors that influence the costs of software evolution. In addition, a large body of research is dedicated to measurement of software evolution [12]. Measurement and estimation of software evolution is closely related to reliability and quality of software systems, as well as to social factors that influence evolution process.

III. TYPES OF EVOLVING SOFTWARE SYSTEMS

Software evolution is based on Lehman SPE taxonomy of evolving software systems [2][7]. This taxonomy is later refined and redefined as SPE+ taxonomy [10]. SPE+ includes recent achievements in the research and practice. This taxonomy is related to the program evolutiveness, or the level of traceability during software life cycle. It is important to note here that software systems are subjects to change. However, change realization is not the same in different software systems. Maintainability depends of a software system and human resources (team, individuals, skills, experience), as well as technical factors (technologies, platforms, tools, methods).

Types of evolvable software systems are defined with the assumption that each program is a model or an abstraction of some portion of the world or of some universe of discourse. Three basic types of software systems are: S type, P type and E type.

Function of *S-programs* is formally defined or derived from a *specification*. Fig 1. shows that a specification, as a formal definition of the problem, directs and controls creation of program that defines the solution that can be of interest in observed universe. Correctness of S-programs is judged based on the specification. Changes in the domain or the universe cause that these programs become inadequate. Change leads to new software that is solution for another problem, different from the first one. In practice, the evolution of S-programs occurs only during the initial development [13]. S-programs are those that have strictly defined computing, mathematical functions or formally defined transformations. Sample programs are compilers or proof procedures.

P-programs are programs that provide solution of a *problem* from real world. Problem should be precisely defined. Program can be accepted only after validation in the real context where it is integrated. The process of

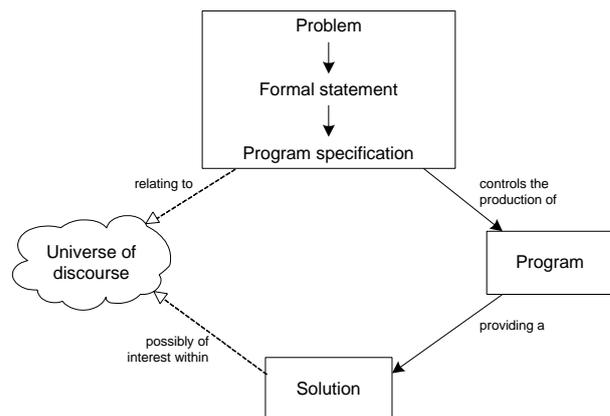


Figure 1. S-Programms [2]

creating P-programs is presented at Fig. 2. Changes in the real context influence changes in P-programs. Therefore, P-programs become inefficient. Researches suggest that in practice P-programs satisfy the conditions of either S-programs or E-programs [10].

In many domains where software is used it is practically impossible to install and use S-programs and P-programs because it is not possible to create formal specification that is complete and final [13]. The most of the changes in software systems (software that is useful for somebody) are implemented in maintenance phase of software life cycle, and this leads to the fact that software systems evolve over time in order to be useful. Software systems that are integral part of some real context and *evolve* within it are *E-programs* (Fig 3). In that context, they are subject of change initiated from people that use software.

SPE+ taxonomy is defined in order to provide redefinition of SPE taxonomy as a basis for empirical studies in software engineering. The default category of software is E, while S and P are special cases that are consequence of specific user requirements. Definitions in SPE+ do not have roots only in software engineering domain. Instead, definitions are also based on relevant philosophical traditions and theory of general evolution theory.

IV. SAMPLES FROM PRACTICE

In last few years at Technical faculty “Mihajlo Pupin” in Zrenjanin have been implemented many technological projects. Here are shortly discussed software systems developed at Information technology department as a results of the following projects:

- *Web Portals for Data Analysis and Consulting* – Funded by Ministry of Science, Republic of Serbia, under the project number TR13013, 2008-2010.
- *The development of software tools for business process analysis and improvement* - Funded by Ministry of Education and Science, Republic of Serbia, under the project number TR32044, 2011-2014.

Software tools have been developed as a product of teamwork in period from 2008 to 2012. Software tools have been developed by using various technologies and solve problems in various fields such as software maintenance [14], configuration of online virtual laboratory [15], and data analysis [16][17]. All these software systems have been evolved (unfortunately not always in controlled manner) and changed over time in order to fulfill specified requirements. Therefore, all software can be classified as E-type software systems.

However, more detailed insight into the design and architecture of developed software tools reveal that these tools are composed of software modules that should be differently classified. Some modules are E type, while some of them are S- type. This classification is based on the possibility of a module to evolve within the software system and within the whole technical system.

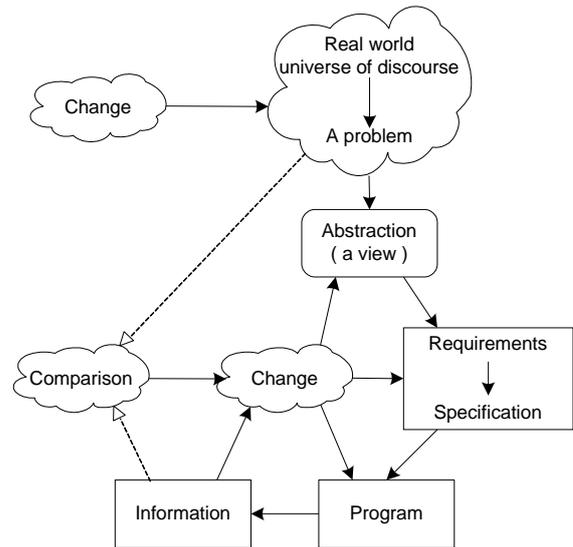


Figure 2. P-Programms [2]

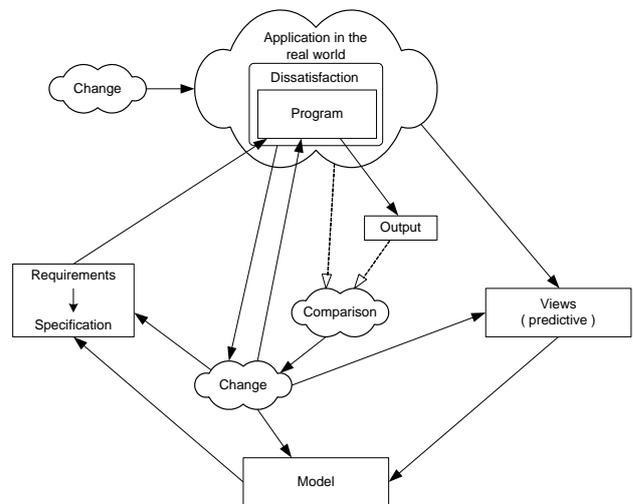


Figure 3. E-Programms [2]

A. *Web application for tabular data analysis*

Web application developed for the analysis of tabular data has the following layers [17]:

- *Client side layer* – executed in the Web browser on portal user machine, responsible for presenting the portal to the user,
- *User communication handler layer* – a layer responsible for handling communication with the portal users on the server side,
- *Application logic layer* – the main layer on the server side responsible for overall application functioning,
- *Data analysis interface layer* – provides interfaces between Application logic layer and data analysis modules,
- *Data analyses modules layer* – modules responsible for performing the data analysis for provided data [16],

- *Database access layer* – layer responsible for accessing relational database,
- *Database server* – layer responsible for storing all relevant data about performed data analyses and all aspects of server functioning.

The iterating algorithm that is part of *Data analyses modules layer* exploits functional dependences between condition and decision attributes which are expressed in the form of If Then rules. This module is S-type software tool because any small change in the specification of the rules will lead to different tool. However, all other layers are implemented with the software modules that are E-type software.

B. Application for configuring Network Nodes

This application is developed as a utility tool for configuring network nodes within the virtual network laboratory VNLab [15]. The main components of this application are:

- *NNDLNodeConfigurator* – the main component that controls and coordinates the work of all components,
- *FileReceiver* – receives NNDL file from the server and stores it on the node,
- *NNDLConfigurationParser* – a group of components that parse received NNDL configuration file
- *NNDLTemplates* - the library of classes that contains NNDL definitions for all network concepts

Although all these components were developed to process NNDL files with strictly defined structure, they are E-type software tools.

C. Application for managing network scenarios

This application is developed as part of virtual network laboratory VNLab [14]. This is typical client server application with three-layer architecture. It enables fast and reliable creation and management of network configuration files with NNDL language. All components in this application are of E-type, and therefore, this is E-type application.

It is important to note that these software systems are under continuous development and improvement, because new functionalities are currently developed and considered for inclusion in developed systems, or some existing functionalities are under the process of improvement.

V. CONCLUSION

Software systems evolve during their life cycles. In this paper are outlined the basic principles of software evolution with the focus on the types of evolving software systems accepted by scientific community and practitioners in industry. Short discussion is also included in order to provide an overview of sample software tools recently developed as results of technological projects

implemented at Technical faculty “Mihajlo Pupin” in Zrenjanin at Information technology department since 2008. All these software tools continuously evolve within the environments, and therefore they are classified as E-type software systems.

The further work will be directed towards tracking the evolution of existing software systems, and classification and tracking of newly developed software systems.

ACKNOWLEDGMENT

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Overview of the Initialization in Human Motion Capture and Analysis in Sport

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Abstract - This survey reviews advances in human motion capture and analysis. Human motion capture continues to be an increasingly active research area in computer vision with over 70 publications in last ten years. A number of significant research advances are identified together with novel methodologies for automatic initialization. Initialization is first phase in human motion capture and analysis process and represents a base for further research in this field. Initialization includes necessary activities to ensure that the system starts its work with the correct interpretation of the current scene.

I. INTRODUCTION

Data mining in sport is experiencing rapid growth in recent years and is slowly attracting the attention of the largest sports associations. The baseball team Boston Red Sox and the football club AC Milan were among the first organizations that started to apply the benefits of data mining. People with special merits for the introduction of data mining in the sport were Dean Oliver, who introduced this methodology in basketball and Bill James, who did the same in baseball.

Before the implementation of data mining, sports organizations have relied almost exclusively on human factor. It was believed that experts in a given sport (coaches, managers, scouts) could successfully convert collected data into practical knowledge. As the different types of collected information increased, these organizations have been looking for more practical methods that could extract knowledge out from data. The way to use large amounts of data available to sports organizations, led from engaging additional statisticians in order to achieve better and more accurate analysis, to adopting techniques of data mining. Data mining can lead to better overall team performance by analyzing the behavior of players in certain situations, determining their individual impact, revealing the opponent's tactics and pointing out possible weaknesses in the play.

According to Schumaker et al. [1] in the next few years, the application of data mining in sports will face several challenges and obstacles. The biggest obstacle will be to overcome opposition to new technologies that some members of sports organizations, who prefer traditional way of acquiring knowledge, demonstrated. The same authors suggest that the application of data mining in sport is at a critical point and that a number of features it brings

are waiting to be exploited. Some of these features will quickly bring the desired results, while others will take years and even decades. They also point out that the primary task is not to determine the correct way in collecting data, but to determine which data should be collected and how to use them in the best manner. Markoski et al represented some basic ways of using data collected in basketball games [2].

While the use of statistics in decision-making is certainly an improvement over the use of instinct of coaches, managers and scouts, statistics alone can go in the wrong direction without knowledge of the problem domain. The first part of the problem is to determine the performance metrics. A large number of existing sport metrics can easily be used inappropriately [3]. Ballard [4] has presented a typical example of inaccuracy in data collection in basketball. He gives the example of a jump in the defense, which represents the number of times a player catches the ball in the defense after the opponents unsuccessful shot. In order to record a jump in the defense, teammates have to block the opponent's players and keep them away from the basket. By blocking the opposing players, basketball players usually do not have the opportunity to catch the ball. However, their performance in the defense makes them equally important in order to catch the ball. By observing the way of recording defense rebounds, it can be seen that only the player who catches the ball is awarded with rebound. The second part of the problem is to find interesting patterns in data. These patterns may display movement and intentions of opposing players, reveal the beginning of injury during training or predict outcome based on the previous games. Practical method in finding those patterns could be appliance of neural networks [5].

II. MULTIMEDIA AND VIDEO ANALYSIS IN SPORT

Sports events have become available in digital form as part of multimedia databases. Search of video and multimedia content is becoming more common in sports due to large number of tools that were previously developed for text search. Automated methods of examination matches are used for parsing video content, and then translating it into a form that can be searched [1][6].

Traditional sports statistics has quickly become insufficient in comparison with the advantages of

multimedia technology. In recent years the usage of videos for recording and allocation of certain events for later analysis, has become a commonplace. For example, baseball players in American professional league visit a team multimedia room and study the ways in which the pitcher sends the ball in order to prepare before the game or to correct play during the match [7]. Advanced Media represents the leading company in the analysis of video material from baseball game. It handles digital content from first baseball league (MLB - Major League Baseball), which includes live transmission of matches to viewers and web-based MLB Game Day tool that allows tracking of basic information about the matches. Basketball teams are using similar service for the analysis of video content that finds specific types of shots or locations from which the shots are performed [8]. Before this technology became available, teams usually had to wait several days to retrieve material from the match, and then parse it according to its needs. Another technology that allowed faster analysis and transfer of video materials and knowledge obtained by their analysis is internet [9][10]. Due to these technologies, videos are almost immediately available to players, coaches and scouts.

Analysis of the movements of players in sport games can be classified under the broader category, called the human motion capture.

III. HUMAN MOTION CAPTURE

Analysis of human activities using computer vision is widespread. Its attractiveness is based on a broad area of application and great complexity. Complexity represents a challenge in the research, seen from a purely academic point of view [11]. From the point of application, computer vision based methods are often the only form of non-invasive solutions, which makes them especially attractive. The process of registering the movement is called the human motion capture [12]. Although this term covers many aspects, it is mainly used for recognition of obvious movement of a human (the movements of the head, arms, torso and legs). This term also refers to the situation when the subject is seen as one object, as well as when it is observed as a movement of skeletal structure with a high degree of freedom. The previous definition does not cover smaller-scale movements of the body such

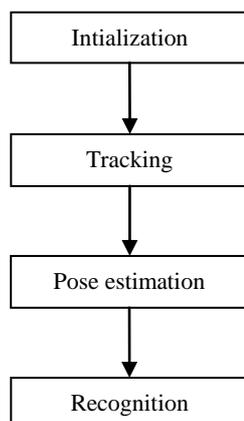


Figure 1. The functional structure of the system that analyzes the movement of the human body

as facial expressions and hand gestures.

Over the past three decades, the number of papers in the area of human motion capture using computer vision has significantly increased. The global structure of the system for recording the movement and different types of information that is processed gives a functional structure of the system shown in Figure 1 [11][12].

Before the system becomes ready to process data, it must be initialized, i.e. an adequate model for the subject of observation must be created. Next step is following the movements of the object. This brings the way in which the subject will be separated from the background, as well as the way to find the correspondence between segments in successive frames. Pose of the subjects' body often needs to be estimated because that pose may represent the output of the system that will allow control of avatars (graphic representations of human body) in the virtual environment, or can be further processed in the recognition phase. The final process consists of analyzing positions or some other parameters, in order to recognize actions performed by the subject of observation.

The system does not have to include all four processes, which is especially the case in research papers dealing with one of the methods in the process. However, all systems can be described within this [12].

IV. INITIALIZATION

Initialization includes necessary activities to ensure that the system starts its work with the correct interpretation of the current scene. In the past, term initialization was used for data pre-processing [13]. Some parts of the initialization can be executed before the start of motion detection, while other parts are mainly involved in the first phase.

A large number of systems for monitoring, based on computer vision, imply the fact that manlike kinematic structure with a fixed number of joints and known degree of freedom of movement already exists. Initialization is then limited to the assessment of limb length. Commercial systems use markers that record pre-defined movements. They are used to determine the individual degrees of freedom of movement. Known correspondence between the markers and limbs, together with the reconstructed 3D markers trajectory during the movement is used to accurately determine the length of the limbs. Strong restrictions on the symmetry of left and right sides of the skeleton are often imposed in the calculations. A large number of papers are related to body pose initialization and limb length [14][15][16][17].

Direct estimation of kinematic structure based on several moving people is also the subject of research. Krahnstoever et al. presented a method for automatic initialization of kinematic structure of the upper body, based on a movement extracted from a series of individual pictures [18][19]. Song et al. presented unsupervised learning algorithm, which follows the characteristic points in complex scenes in order to create a kinematic model of the entire body automatically. Learned models are then used to track the movement of pedestrians by laterally placed cameras [20]. These approaches provide general

solutions to the problem of kinematic model initialization because they directly distinguish the desired structure from the observed scene

There are methods that are used to extract the kinematic structure from a variety of 3D shapes. Cheung et al. initialized the kinematic structure person based on visual frame, by moving each joint independently. The whole skeleton is obtained by fitting the parts of the body in motion with the visual frame in a particular position [21]. Manier et al. presented an automated approach to 3D pose estimation based on the central axis of the person's visual frame. Kinematic structure is initialized independently in each frame, allowing robust tracking [22]. Brostow et al., [23] presented a more general framework to assess the structure of the spine that is based on 3D shape time sequence. The spine is estimated in each frame based on the known forms that have been identified for this purpose. These papers show the approximate reconstruction of kinematic structures for babies, adults and animals.

Initializations of angles in the joints and limits they define in kinematic structure of the human body represent an important constraint that must be considered in order to estimate possible movement and poses. Manual specifying of the angles of the joints is a common method used in a number of algorithms for motion estimation using anthropometric data. Complex nature of the restrictions in the joints and coupling between restrictions for different degrees on freedom of movement is not taken into account. Numerous researches which examine learning models for the restrictions in the joints and their correlation have been conducted in order to overcome these limitations. Anthropometric models for relationships between angles in the joints of the hands (shoulders, elbows and wrists) were used to obtain limits in visual tracking and 3D pose estimation of the upper body [12][24][25]. There have been conducted some studies that examine modeling of the joint limits based on measurements of human movement recorded using markers [26][27] and clinical data [28]. These papers have demonstrated improved performance in the human pose assessment of a person that performs complex movements of the upper body.

Later studies have been directed to algorithms training in order to identify possible locations for parts of the body which are then combined probabilistically to locate people [29][30]. Initialization of such models requires a large set of training data for both positive (containing the object) and negative (do not contain the requested object) for different parts of the body. AdaBoost-like approaches have been successfully used to learn the parts of the body such as face [31], hands, arms, legs and torso [29][30].

The sequences of human motion tracking from commercial systems that use markers are increasingly used in order to learn models of human kinematics and specific movements, all in order to provide constraints for subsequent researches in this area. Databases with recorded movements have also been used in order to create a synthesis of images with known 3D poses. The goal is to identify knowledge needed to map images into the poses.

V. CONCLUSION

Over the past several years, vision-based human motion estimation and analysis has continued to be a thriving area of research. This survey used over 30 papers from major conferences and journals. Increased activity in this research area has been driven by both the scientific challenge of automatic scene interpretation and the demands of potential mass-market applications in surveillance, entertainment production and indexing visual media. This survey has its basic focus on initialization which contains initialization of model shape appearance and its pose.

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Model of Web Environment for the Assessment and Prevention of Drug Addiction Behavior

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Abstract: This paper describes model of interactive web environment based on content management systems, which integrate several tools and subsystems specialized for assessment and prevention of drug addiction behavior, enables the collection and organization of data about addicts (demographic, social context, cognitive state, and drug-seeking behavior). Environment for assessment and prevention of drug addiction trying to raise consciousness about bad influence of addictive substances such as alcohol, nicotine, hallucinogens, cannabis, cocaine, amphetamine, cannabis, sedatives, etc. Environment provides tools for visualization, interpretation and analysis the collected data and aim to warn the users about possible sensitive periods in which maladaptive behavior instances may occur.

Data mining techniques integrated in such environment allow processing of the collected data and create reports about drug addiction behavioral patterns. This interactive environment contains several agents that help the users during the registration to the system, that guide the users through the process of assessment and during data collection, and assist healthcare professionals in their activities. This environment collects data used to provide useful information and advises for potential or effective addicts how to recognize and avoid patterns that lead to risk behavior.

I. INTRODUCTION

Drug addiction is responsible for major health and social problems. Brief interventions have been shown to be effective, but there have been difficulties in reaching those who might benefit from them. Web-based intervention is likely to be acceptable to drug addicts and may produce some health benefits. Programs of this type may have the potential to reach large numbers of addicts who might not otherwise seek help^[1].

Assessment and treatment of addiction related problems are time-intensive procedures that often are difficult to implement in busy clinical settings. Computer-based tools are one approach that may enhance the availability and cost-effectiveness of assessment and intervention and also may offer other advantages over face-to-face interventions^[2]. Psychological advice, help, and treatment for addicts are no exceptions, with both counseling and psychotherapy entering the computer age.

Healthcare professionals working in the field of addictive behaviors cannot afford to ignore the Internet^[3]. Software tools and internet-based solutions can be used for the

assessment, prevention and treatment of specific populations with addictive problems^[4,5].

The Internet combines attributes of mass communication with attributes of interpersonal communication (e.g. interactivity, individual feedback). This combination makes the Internet an effective means of implementing behavioral health interventions on a large scale. Internet-based solution have the potential to make a major impact on public health because widespread use of the Internet, ability to provide well-designed and personalized resources, and high level of interest in such services by drug addicts. This approach could be useful because worldwide access including developing countries, as a way to help underserved populations (for example young adults), those living in rural areas or who have limitations with transportation. Web site with integrated tools can be used for collecting information about drug addicts (using structured collections of questions) and it can provide personalized feedback related to their problems^[6,7]. Web based environment can be useful in post-treatment support; it can be used for maintenance of previously established relationship between client and healthcare professionals^[8].

There are a number of ways in which computers and the Internet may be used to deliver interventions for mental health disorders. These include stand-alone computers (e.g. in doctors' office or the home); pre-programmed, interactive software packages available via the Internet; or psychotherapy delivered via the Internet with live therapist involvement (real time or via messaging) known by terms such as e-therapy. Information technologies can be used for diagnostic, psychotherapy, collaboration and communication. Technology in psychotherapy can be applied as Internet sites for self-help, computer guided therapy, applying smart phones and laptops in therapy, therapy using virtual reality, interactive systems with voice messages and biofeedback using psychological exam in ambulant conditions^[9]. Development of telecommunication and computer infrastructure enables process of migration from classic communication and collaboration to new form of electronic communication using different Internet services^[10]. The traditional model of communication where therapist directly communicates with patients can be replaced with model where appropriate software is engaged in communication between therapist and patients^[11]. Programs for self-help can be presented on web pages, and treatment is

performed by e-mail through structural interview and user's interactions with therapist. Treatments performed on Internet, in some cases, can be as efficient as treatments performed by healthcare professional^[12]. Framework for Integrated Testing (FIT) represents online environment that contains diagnostic tests or tests for knowledge evaluation and enables collaboration of different categories of users.

Content management systems represent online tools in web environment that enables publication, modification, control, interaction and organization of different contents (text, images, animation, audio and video files and other digital information)^[13]. Workgroup support systems (WSS) are based on combination of software and web services. Software for collaboration enables users to work together on the same project and to avoid space and time limitation. Using software for collaboration, users can gather in virtual teams and virtual communities^[14]. In this web environment, content management system is used for integration several technologies for assessment addictive behavior, therapy and collaboration providing a place for gathering persons interested for evaluation their cognitive capabilities (patients) and healthcare professionals.

Computer-based assessments and interventions are a promising avenue for increasing the accessibility and cost-effectiveness of treatment for alcohol-related problems. With programs used for assessment and diagnosis of alcohol-related problems, it is particularly important to focus on instruments that have acceptable psychometric properties (i.e., those demonstrated to reliably measure certain psychological variables)^[2]. Implementation of diagnostic tests on computers provides evaluation and creation of reports immediately after testing. This enables users to get faster feedback information about achieved results. The overall time testing decreases, safety of testing procedure increases and testing can be performed more often than in classic form^[15]. Using online assessment tools allows easier collecting information about drug addicts. These data can be used for assessment or research. Computer version of the tests directly stores data in databases and automatically processes data, which eliminates costs and errors that can appear during analyzing results of paper version of tests. Applying computerized adaptive testing (CAT) can provide interaction with users in a real time and generates optimal tests for individual user^[16]. Information technologies can be used for computer evaluation, supervising the patients, electronic contact and treatment^[17].

Software agents are computer programs that can assist the user with computer applications to accomplish their tasks. Agents should be able to sense and act autonomously in their environment. Agents present software that, in interaction with environment, is capable to react flexible and autonomous by following assigned goals.

Interaction with environment means that agent is capable of responding on input values from sensors, which it reads from environment, and it is capable to take a course

of actions in order to change agent's environment^[18]. Agents must be able to process data, and for that purpose may have several processing strategies. They should be designed to use simple strategies (algorithms), or they could use complex reasoning and learning strategies to achieve their tasks. The concept of interface agents that collaborate with the user in the same work environment, helping him/her to perform various computer-related tasks, was introduced by in the 90's with a reasonable success. This help may range from hiding the complexity of difficult tasks, training the user or making suggestions about how to achieve specific activities, to directly execute actions on the user's behalf^[19]. In order to provide personalized assistance, agents rely on user profiles modeling user information preferences, interests and habits. Inserted in communities of people with similar interests, personal agents can improve their assistance by gathering knowledge extracted from the observed common behaviors of single users. Agents help users find relevant information based on detailed models of their interests contained in user profiles^[20].

Collecting large amount of various data in modern information systems creates need for software that can efficiently retrieve and select information when they are needed^[21,22]. Structure, format and meaning of these data are various and usually they can not be modeled mathematically. That's why analysis using standard methods is complex or sometimes impossible. Systems for intelligent data analysis (data mining, knowledge discovery in databases) represent software tools capable to analyze content of large databases and to find relations between data^[23]. Increasing database volumes leads to increasing demands for development efficient software tools for data analysis.

Data mining can be defined as efficient method for discovering rules, patterns and knowledge in large databases. This technology is motivated by the need for techniques capable to analyze, understand and visualize the huge amount of stored data gathered from scientific and business applications. Data mining involves the semiautomatic discovery of interesting knowledge, such as patterns, associations, changes, anomalies and significant structures from large amounts of data stored in databases and other information repositories. Data mining differs from traditional statistics in several ways. Statistical inference is assumption-driven, in the sense that a hypothesis is formed and validated against the data. By contrast, data mining is discovery driven; patterns and hypotheses are automatically extracted from large databases. Second, the goal of data mining is to extract qualitative models that can easily be translated into patterns, associations or logical rules. The major data mining functions that have been developed for the commercial and research communities include generalization, summarization, classification, association, prediction-based similarity search, and clustering^[24]. Using a combination of machine learning, statistical analysis, modeling techniques and database technology, data mining finds patterns and subtle relationships in data

and infers rules that allow the prediction of future results. Combining agent and data mining these two innovative technologies together can improve their performance. Integrating agents into data mining systems, flexibility of data mining systems can be greatly improved. Equipping agents with data mining capabilities, the agents are much smarter and more adaptable^[25].

Problems such as non representative population, inability to control diagnostic's condition, possibility that one user performs the same test several times, maliciously and careless performing the tests can appear in computer version of test procedure^[26]. Those problems can be avoided by integration of tests in interactive environment for assessment and prevention of drug addiction behavior, supervising process of testing by field experts (when it is necessary), classifying users on several groups or categories with different privileges and access rights.

Patients that need a treatment often delay the necessary therapy. Reasons for delaying of the treatment can be shyness/inconvenience, long distance from place where they can receive suitable treatment. Possibility to approach the information and services from users own environment disables barriers that can occur in some patients. Treatments based on computers and Internet can offer solution for solving problems in such cases.

II. ENVIRONMENT FOR THE ASSESSMENT AND PREVENTION OF DRUG ADDICTION BEHAVIOR

Computers and the Internet can be efficiently used for on-site assessment and delivering self-help materials for education. Internet-based environments allow the user to access the service as required without regard to normal business hours, set appointment times, or waiting lists, it allows users a high level of convenience and flexibility of use; the intervention is not confined to a specific physical location, and is available 24 hours a day. Content management systems (CMS) are mainly used for managing text and pictures, they enable observing work process, storing digital information, control versions, managing users and their privileges, managing user's interface and managing applications. Similar technology can be applied in development web based environment for the assessment and prevention of drug addiction behavior, but it will also contain subsystems and tools that are adapted for healthcare professionals work. In this environment, content represents: information about users, behavioral, cognitive and neuropsychological data, several diagnostic tests and questionnaires for detecting addictive behaviors and programs for therapy. Healthcare professionals can simply create lists with appropriate diagnostic tests and have possibility to supervise testing, control over tests and test process. Web environment contains integrated tools that enable processing, visualization and interpretation of collected data. By individualized feedback users encourage are to learn more about methods and techniques how to reduce stress levels and how to avoid their addiction problems. Users of this environment can use software tools and

technologies for communication and interaction such as e-mail, audio/video conferences, instant messages/chat, sharing applications, WIKI, web calendar or application for sharing desktop.

Interactive environment for assessment and prevention of drug addiction behavior is based on combination of two technologies: content management system (CMS) and computer supported cooperative work (CSCW). This interactive environment enables evaluation of patterns in addiction behavior using several screening and assessment instruments, collecting information about users, organizing this information in user's personal profiles, visualizations, interpretation and analysis results of tests, control over procedure of testing and making conclusions on collected data^[27]. According to functionality, components of system can be classified on several categories: diagnostic drug addiction behavior, collecting and storing information about users, data analysis, communication interaction and collaboration of users.

Environment for assessment and prevention of drug addiction behavior provides tools for assessment, education, communication and trying to raise consciousness about bad influence of addictive substances (alcohol, nicotine, hallucinogens, cannabis, cocaine, amphetamine, cannabis, sedatives, etc).

Interactive environment for the assessment and prevention of drug addiction behavior provide:

- screening/assessment instruments and interactive collections of questions for detecting addictive behavior,
- control over procedure of collecting information about users (individuals and group of users),
- ability to store behavioral, cognitive and neuropsychological information in a database format so that it can be studied and analyzed by a supervising therapist or health care professional,
- patient's profile based on collected data information,
- estimating risk in users behavior (low, moderate, or high risk) based on patterns in collected data,
- interpretation, visualization and individualized feedback based on collected data,
- supervising users to achieve assigned goals,
- training in areas such as self-monitoring, drink refusal skills, functional analysis of drinking, and problems solving,
- communication between patients and healthcare professionals,
- place for gathering different categories of users,
- place where users can find post-treatment support when they need it,
- platform for collaborative work.

Central part of web environment for assessment and prevention of drug addiction behavior represents content management system that connects all other subsystems. Users usually access tools from web environment using web browsers, but environment can be adapted for access using mobile devices.

III. COLLECTING INFORMATION ABOUT USERS

Subsystem for collecting information about users is activated when user visits environment for the assessment and prevention of drug addiction behavior for the first time. Subsystem contains several questionnaires for collecting demographic (age, gender, socio-economic status, ethnicity, culture, geographic location, marital status, education, employment status, type of job), cognitive state, drug-seeking behavior, type of addictive substances (alcohol, nicotine, hallucinogens, cannabis, cocaine, amphetamine, cannabis, sedatives, etc), medical and psychological data about users. This agent assists in creating the initial profile. Setting the initial profile will influence the further updates and usage of it, therefore, special care should be taken at this stage to assist the user in completing the questionnaire. At this stage, the agent will use stored knowledge about typical user's characteristics to set values in the user's profile.

Agent A1 supervises users during their first visit the environment for assessment and prevention of drug addiction behavior and helps them to complete questionnaires. Answers from questionnaires are evaluated in subsystem for reviewing and preprocessing before recording in database. Agent A1 checks over the answers and depending on answer in some question, it can ask some additional questions if that is necessary. This agent provides dynamical questionnaires and it has a goal to create more precise initial user's profile. This method provides mechanism for avoiding other users to waste their time on irrelevant questions. Agent can provide help and assistance in a form of text, animation or video if it is necessary.

A first-time user, who is registering in the environment for the assessment and prevention of drug addiction behavior, might not want to give all the information during the first visit. Forcing users to complete a long questionnaire could cause that they give up at start. The information that the user supplies can go in the user's profile directly, but many parameters and values will remain empty because of the lack of direct user's input. To fill the missing information in the user's profile, the agent can apply a set of rules based on default values. Agent will help users to understand the implications of the presented questions and to make correct choices.

After user finishes with answer on base questions, agent A1 will allow him to access to other tools in environment, even he/she hasn't answered on all questions. Some tools on environment require user to fill questions that haven't been filled during the registration. In that moment, agent will activate questionnaires again asking user to fill missing questions.

Environment collects data about user related to their specific addiction problem. For example, alcohol consumption was assessed by asking participants to report the largest number of drinks they consumed on a single occasion as well as on typical occasions. Questions were used from a quantity–frequency variability index that assessed quantity and frequency of alcohol

consumption, both overall and within type of drink. User need to report the number of days a week a week the person drank any alcohol (never, once a week, 1–2 days a week, 3–4 days a week, 5–6 days a week, 7 days a week). In addition user need to report usual and largest number of beers, glasses of wine, and shots of hard liquor consumed on the days when drinking. There are also question that help user to understand how drug addiction have influence on their friendships/social life, physical health, home life or marriage, work and professional carrier, studies, or employment opportunities, and financial situation.

IV. GUIDING USERS TROUGH ENVIRONMENT AND INTEGRATED TOOLS

Environment contains several screening and assessment instruments and self help programs. This can confuse new users and cause lack of their motivation. Agent A2 trying to avoid this situation guiding new users trough available options helping them to select only options related to their addiction problems.

This interactive environment contains several agents that help the users during the registration to the system, that guide the users trough the process of diagnostics and during the daily data collection, and assist healthcare professionals in their activities on this system. These agents mainly supervise the user's actions and their personal profiles, adjust the questionnaires and other integrated tools to the specific user's needs, making this environment easier to use. The agents use a data mining system to make their decisions more precise. User interfaces play an important role in achieving user acceptance. User modeling can be useful for providing personalized services to a particular user, providing proactive feedback to assist the user and for presenting the information in a way suitable to the user's needs^[28].

The role of agents in the environment for assessment and prevention of drug addiction behavior is to provide task-related feedback and assistance to the users and to guide the users through process diagnostics and help them to reach his/her goals. Agents in this environment are used for helping users during process of registration (agent A1), collecting information about users activities (agent A2), helping health care professional in their work on system (agent A3), and providing individualized feedback (agent A4).

Agent A1 trying to help users to complete questionnaires during their first visit to environment for assessment and prevention of drug addiction behavior.

Agent A2 trying to guide new users trough available options (screening and assessment instruments and self help programs) helping them to select only options related to their addiction problems. When user starts to use environment, agent A2 doesn't have much information about certain user and in this case it will suggests one of default tests according to information from user's profile. As environment collects more

information about some users, agent A2 has more possibilities to make more precise suggestions for user's next steps. This agent uses information from user's profile to make available options more personalized and more related to users addiction problem. Agent A2 makes decisions based on predefined rules, but it also uses data mining subsystem to make more efficient suggestions. Agent doesn't force users to follow advices and suggestions strictly, these can be ignored. Agent A2 is able to select the appropriate interface for different ability levels of users. New users need a simple interface that provides the ability to get help when required, while more experienced users may need minimal help and may want to skip some of the steps in the using available tools.

Agent A3 helps health care professionals with their activities (monitoring users, evaluating user's profiles) in the environment. Agent A3 monitors information from user profiles that could be interesting for health care professionals and generate reports with overview information about the users' performances or it can suggest live communication between health care professionals and user when that is necessary.

Agent A4 trying to provide individualized feedback and activates one of self-help programs based on collected data. For example, according to diagnosed level of alcohol consumption it will provide different advices for users with low, moderate, or high risk for alcohol-related problems, encouraged them reduce their quantity and frequency of alcohol consumption, and to learn more about the impact of alcohol.

The basic idea is that agents monitor given set of information and process them trying to find suitable suggestions for users. Initially, the agents start with general information about users. As a user interacts with the diagnostic tests, questionnaires and other tools on environment, he/she provides more information about itself.

V. INTERPRETATION AND VISUALIZATION OF RESULTS

Subsystem for interpretation and visualization of results generates the reports based on information collected in database. Using this subsystem, users can visually compare their using of addictive substances with normatives and easily estimate level of their own problem. Personalized feedback could be key components that motivate people learn the skills necessary to change their behavior. Subsystem for interpretation and visualization generates the reports with multiple detail levels. Environment provides reports with summary information, but also there are reports with more detail information such as levels and trend lines of using each addictive substance (per weeks, month, 3 months).

VI. PREVENTION OF DRUG ADDICTION BEHAVIOR

Information about users collected in databases using screening and assessment instruments are used for

creating personalized feedback that could cause changing in addictive behavior. Environment trying to motivate, encourage and help users to learn methods and techniques for reducing stress levels and learn the skills necessary to change their behavior related to their addiction problems.

Environment enables users to compare their summary information with consumption normatives by addictive substances (average male or female in the general population). For example, many heavy drinkers and smokers overestimate the consumption of others. Feedback with normatives could motivate users to re-evaluate their consumption patterns. This kind of personalized feedback could be very effective for individuals that learn something new or for whom the feedback contradicted previous beliefs. Environment interacts with users by automatically generating responses according available information and preprogrammed algorithms, if that kind of help does not give positive results drug addict can get correspondence with therapist or health care professional.

VII. ANALYSIS OF COLLECTED DATA

Data mining represents process of extraction potentially interesting information from raw data stored in database. Data mining allows processing the large amount of data and reports about potentially interesting information. Integration of data mining in environment for assessment and prevention of drug addiction behavior simplifies procedure for analyzing of collected data and reduces time for processing results. Healthcare professionals use data mining subsystem to identify users with problematic behavior that need live communication and for research for finding correlation in demographic, social context, cognitive state, drug-seeking behavior and medical data collected about users^[29]. The agents use a data mining system to make their decisions more precise.

VIII. CONCLUSION

Environment for the assessment and prevention of drug addiction behavior provides tools for diagnostic, education, communication and trying to raise consciousness about bad influence of addictive substances. Technology integrated into this environment can improve the efficiency of drug addiction assessment and prevention; also, this environment could provide tools for collaboration and communication between users. This environment integrates several subsystems such as: assessment tools, subsystem for collecting data about users, subsystem for analyzing collected data and subsystem for interpretation and visualization results. This interactive environment, beside tools for assessment and self-help programs, enables methods for communication and interaction between drug addicts and healthcare professionals. Agents supervise user's actions in the environment and they are trying to adjust assessment instruments, interactive questionnaires, self-help training programs and other integrated tools to

personal user's needs making this environment easier for use. Advantages of this environment can be shown from perspective of drug addicts and healthcare professionals.

For healthcare professionals, assessment tests from this interactive environment represent easy available diagnostic tool for classifying patients with addiction behavior. Environment provides control over process of collecting data about drug addicts and monitoring progress of therapy. Analyzing collected data, they can identify patterns of addiction behavior. Information from addiction profile of patients can be used for prescribe individual and problem orientated therapy. This environment can be used for maintenance of previously established relationship with patients in post-treatment phase of their recovering. This environment should be considered as a tool that helps health care professionals in their work but not as solution that completely avoids them.

For drug addicts this environment provides easy access to information and interactive tools that can quickly estimate level their addictive problems with technology that they have at home. Addicts can compare their using of addictive substances with normatives and visually track changes in levels of using addictive substances over time. Environment contain pages with personalized feedback and several self-help programs for treatment of addiction problems.

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Tools for Teaching BGP Routing Protocol in Computer Networking Course

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Abstract – This paper gives overview of possibilities in creating networking course exercises for teaching BGP routing protocol. The goal of this research is to summarize various possibilities for usage of simulation and emulation tools in the Computer Networking course. The main topic of presented laboratory exercises is BGP protocol. The BGP protocol exercises are presented in various environments such as: OPNET IT Guru Academic Edition, GNS3 and VNLab. Experiences with usage of presented tools are shown together with analysis of these tools.

I. INTRODUCTION

Rapid development of ICT gives the great importance to teaching process of ICT experts, especially in the field of computer networks. This importance of teaching process is closely related with the quality of teaching tools and equipment used in the laboratory with the focus on practical work. Due to the high costs of the laboratory equipment, its rapid obsolescing and costly upgrade, simulation and emulation software tools have significant role in the teaching process in the university education.

The main goal of this paper is to present and analyze three software tools available for usage in the Computer Networking course. The presentation is based on BGP routing protocol exercises, considering the importance of this protocol. The paper is structured as follows: after the brief introduction about routing protocol basics and the BGP protocol presentation, the three simulation and emulation environments are presented with the example of BGP protocol lab exercises. At the end of the paper, the experience with all three environments is presented as well.

II. ROUTING PROTOCOLS AND BGP

The Internet is a set of routing domains. A routing domain is also called an autonomous system (AS). Each AS is assigned with a unique 16-bit identification number by a central authority. For communication between each other, ASs use inter domain routing protocols.

A routing protocol is the set of rules that router uses to communicate with other routers in order to share information about the reachability and status of attached networks [1].

There are two basic types of routing: static and dynamic.

Static routing is configured by a network administrator. All the routes are manually entered into a router, therefore they remain unchanged until administrator changes them. Due to manual update of routes there is no need for protocol. Static routing is

mainly used with smaller networks, small enough for easy manual maintenance of routing tables, for routing to and stub networks, for defining single default route and for definition of path to networks that are not defined in routing table.

Dynamic routing protocols use information that router share between each other to determine the best paths and to update route table automatically when network topology is changed. Routers learn and exchange connectivity information by dynamically passing updates (dynamical information sharing). Dynamic routing finds the next-best path if the best path to destination is no longer available. Dynamic routing handles failures in external networks and that is the greatest advantage comparing to static routing [2].

Beginnings of dynamic routing protocols date in early 1980s when first protocols have emerged. Over the years many new protocols were released. Most entities are using more recent protocols like Enhanced Interior Gateway Routing Protocol (EIGRP), Open Shortest Path First (OSPF) and Border Gateway Protocol (BGP). Some older protocols are still in use, such as Routing Information Protocol (RIP).

Routing protocol consists of:

- Algorithm that processes routing information for determining best route
- Routing protocol messages used for learning and maintaining information about the network

Today's networks rely heavily on dynamic routing protocols. To lower administrative and operational costs, dynamic routing is usually used in larger networks. Administrator does not have to manually configure routers by adding or deleting new networks like in the case of static routing. Advantages of dynamic routing are that protocols automatically react to network changes, configuration is more error prone and last but not least, networks are more scalable, meaning that when network grows it does not represent a problem. Its disadvantages are that dynamic routing uses more resources (CPU, RAM, and bandwidth) and network administrators have to be adequately educated for configuring, testing and troubleshooting networks.

BGP stands for Border Gateway Protocol which is a dynamic routing protocol that is used for exchanging network layer reachability information (NLRI) between routing domains. BGP is very robust and scalable routing protocol used for exchanging information for Internet and

therefore it is mostly used by Internet service providers (ISP) [3].

BGP protocol exchanges full routing information among neighbors only when connection is established for the first time. When routing table is changed, BGP router sends only routes affected with that change, e.g. only optimal route to destination network.

To maintain scalability and to be able to determine optimal route to destination network, BGP uses route parameters, also called attributes.

BGP path attributes are:

- Weight – used when router has more than one route to destination network. Route with the highest weight will be chosen [3].
- Local preference – calculates degree of preference for each external route. Route with a higher Local preference is chosen [4].
- Multi-exit discriminator – also called metric attribute. It is used as suggestion to external AS for route to AS that is advertising the metric.
- Origin – indicates how BGP learned about a particular route. It can have 3 possible values IGP (origin of 0), EGP (origin of 1) or Incomplete (origin of 3). When choosing path lower origin value is preferred [4].
- AS_path – represents list of AS numbers added to ordered list for every autonomous system route passed through. Prevents looping for inter-AS routing which is BGP main goal.
- Next hop – represents IP address that is used to reach advertising router. Next hop does not need to be directly connected.
- Community – defines a group of destinations so that the routing decisions can be made according to group membership.

Setting up complete network infrastructure with different scenarios for educational purposes is expensive and time consuming. To overcome this obstacle different types of software are used for research, experiments and education.

This paper describes two approaches for creating the laboratory exercises for BGP. First approach is with simulation through discreet event network simulation software. Most notable, discrete-event network software products are ns-2, ns-3, OMNET++, NetSim and OPNET IT Guru. Second approach is with emulations through emulation based lab exercises which can be done with GNS3 combined with Dynamips emulator for Cisco routers or with virtual network laboratories based on virtual machines and virtualization technology.

III. SIMULATION SOFTWARE

OPNET IT Guru is one of most commonly used network simulation products. Its learning version – IT Guru Academy Edition is most popular in academy use

(over 500 universities). IT Guru gives user a chance to use relevant hardware, protocols and application software for projects. Almost every possible technology in real networks can be modeled in IT Guru. Besides that, it is technology independent. IT Guru was made with scalability on mind, allowing user to make everything from simplest network topologies to networks consisting of tens of thousands nodes running in WAN [6]. It is completely based on graphic user interface (GUI). Routers and other network objects are configured with corresponding windows where all properties and attributes can be edited. In final stage of scenario, after running simulation, IT Guru gives comparative analysis of results if multiple scenarios have been run for designed network.

For example, user needs to follow a couple of simple steps to create network with IT Guru.

The exercise starts with creating a new project and choosing No_BGP scenario and an empty scenario in Startup Wizard.

Next step is creation and configuration of network. To initialize network, user can add different types of routers and LAN objects. These objects can be connected with different types of links and all objects can be renamed. Following this step routers are configured, their parameters are set for desired protocol. To finish creation and configuration user configures application in attributes section.

In the next step, simulation is configured by adjusting simulation parameters like duration, global attributes, types of IP interface, addressing mode etc.

To get data for analyses from simulation, user needs to choose right statistics for network objects of interest. Statistics are usually related to routing protocols, and parameters of those protocols.

Before assigning BGP to be used by routers, information about routers' interfaces and their IP addresses needs to be exported. These IP addresses are assigned automatically when simulation starts. After running simulation, Model Directories need to be refreshed so that file that contains all the router interfaces and their IP addresses can be opened. It is located in Generic Data File section of Open file dialog and its file name starts with project name and ends with - ip_addresses.

At this stage everything is ready for creating the BGP scenario. Until now whole network was one autonomous system. At this stage it can be split into desired number of ASs. First, Duplicate Scenario from Scenarios menu and assign it name according to preference, for example BGP_Simple. For each AS user needs to select member of routers, edit their attributes, apply changes to selected objects and to set AS number in IP Routing Parameters. All routers that have interfaces that connect routers across ASs need to have their attributes edited. RIP has to be disabled in Routing protocols attribute located in IP Routing Parameters section - Interface Information subsection.

BGP neighbor information needs to be set for neighbors of inter-domain routers and BGP simulation

will be able to work. Neighbor is defined by interface IP address and AS number. Each inter-domain router needs to have Neighbor Information set in Attributes section/BGP Parameters, values set for IP Address, Remote AS and Update Source attributes.

By creating BGP routing policies with route maps, routers configured in this way can redirect load to other routers. To do this, project needs to be in current scenario (BGP_Simple). Scenario needs to be duplicated and given appropriate name, for example BGP_Policy. Attributes for router that needs to redirect load have to be edited, Route Map Configuration in IP Routing Parameters, has to be more precise. When doing this, goal is to create route map with degree of preference of the route to targeted AS with the value of 10 (normal value Created route map is assigned to links between routers that traffic is redirected from. Option that is needed is located in router attributes, Routing Policies subcategory of BGP Parameters/Neighbor Information).

With all these steps, there are three scenarios created, No_BGP, BGP_Simple and BGP_Policy. All three scenarios run simultaneously (menu option Scenarios/Manage Scenarios).

After finished simulation results are ready for analyses. With Simulation Log, route tables can be examined for chosen router. Routing tables are available for all scenarios that are made (in this case No_BGP, BGP_Simple and BGP_policy). Also, results can be compared with Compare Results option from Results menu. For example, comparative statistics can be made for Traffic Received, throughput for links connecting routers. Results of the comparison are presented with graphs.

IV. EMULATION

A. GNS3

GNS3 is Graphical Network Simulator. GNS3 allows emulation of complex networks using various emulation tools. It runs Cisco Internetwork Operating System (Cisco IOS) in virtual environment with Dynamips. Beside Dynamips, GNS3 supports variety of other emulation programs like Qemu, Pemu and VirtualBox. Since Cisco IOS is used in emulation, user has chance to gain experience with commands and parameters supported by this widely used networking platform in the world.

Software requirements for this exercise are:

- Oracle VM VirtualBox
- Oracle VM VirtualBox Extension Pack
- GNS3 VirtualBox Edition
- Cisco IOS image,

In this GNS3 exercise, BGP configuration will be made using network topology from Figure 1. All routers are members of separate autonomous systems, and example configuration for router R1 will be shown.

For first step, new project should be created with **Save IOS startup configurations** check box activated.

After creating the project, user should add five Cisco routers to main window. Routers should be named like shown on Figure 1.

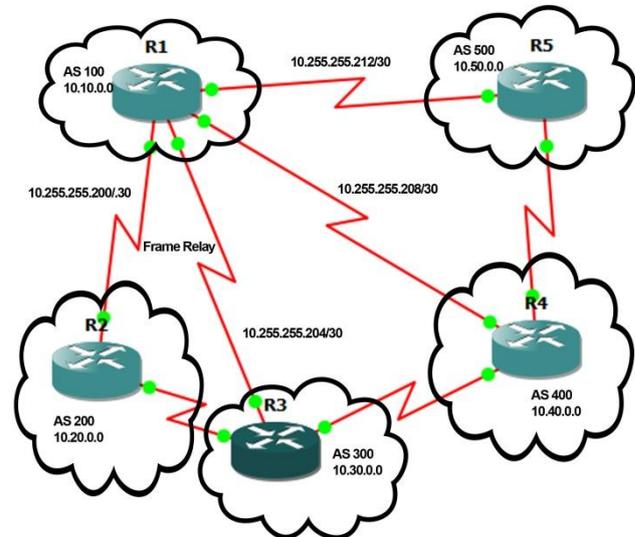


Figure 1. GNS3 exercise network topology

Each router should be assigned with adequate number of network interfaces, one for each link. In this exercise serial interfaces will be used (NM-4T). Required serial interfaces can be added in **Node configurator** (right click on router and choosing **Configure**). Adapters are added in **Slots** tab of selected router.

When interfaces are added, user can connect routers by using option **Add a link** on menu stripe (Figure 2).



Figure 2. Add a link button

In order to link routers, **Serial** link should be selected. It is possible to connect routers by dragging cursors while **Add a link** button is active (red circle with white X). When routers are linked, **Add a link** button can be deactivated. After this, user can start routers with **Start/Resume** button on menu strip.

In next step, routers have to be configured in command line interface (CLI). Double click of router R1 gives CLI access for configuration of BGP protocol.

Configuration starts with following commands:

```
Router> enable
Router# configure terminal
Enter configuration commands, one per line. End
with CNTL/Z.
```

Basic set of commands for interface configuration is:

```
Router(config)# interface Serial0/0
Router(config-int)# ip address 10.255.255.201
255.255.255.252
Router(config-int)# exit
Router(config)# interface Serial0/1
Router(config-int)# ip address 10.255.255.205
255.255.255.252
```

```
Router(config-int)# exit
Router(config)# interface Serial0/2
Router(config-int)# ip address 10.255.255.209
255.255.255.252
Router(config-int)# exit
Router(config)# interface Serial0/3
Router(config-int)# ip address 10.255.255.213
255.255.255.252
Router(config-int)# exit
Router(config)# router bgp 100          #enables
BGP and assigns AS number
```

When BGP is enabled and AS number assigned, the last step is definition of neighbor routers.

```
Router(config-router)# neighbor 10.255.255.202
remote-as 200
Router(config-router)# neighbor 10.255.255.206
remote-as 300
Router(config-router)# neighbor 10.255.255.210
remote-as 400
Router(config-router)# neighbor 10.255.255.214
remote-as 500
Router(config-router)# exit
Router(config)# exit
Router#
```

Since configuration is over, user can view BGP routing table, BGP neighbors or active processes using command such as:

```
Router# show ip bgp
Router# show ip bgp neighbors
Router# show processes cpu
```

B. VNLab

VNLab v2.0 is virtual network laboratory developed at Technical faculty “Mihajlo Pupin” (University of Novi Sad/Serbia) [8]. It combines virtualization technology server software for emulation of computer network nodes (Microsoft Virtual Server 2005 R2) and Linux OS virtual machines configured as servers, workstations and routers. Routers are emulated with Linux OS computers (virtual machines) using Zebra/Quagga routing software [8]. GNU Zebra/Quagga is free multiprotocol routing software. Zebra uses command line interface (CLI) with commands similar to those used in Cisco IOS.

For BGP laboratory exercise VNLab environment, 3 routers and 7 networks are used in scenario (Fig. 3).

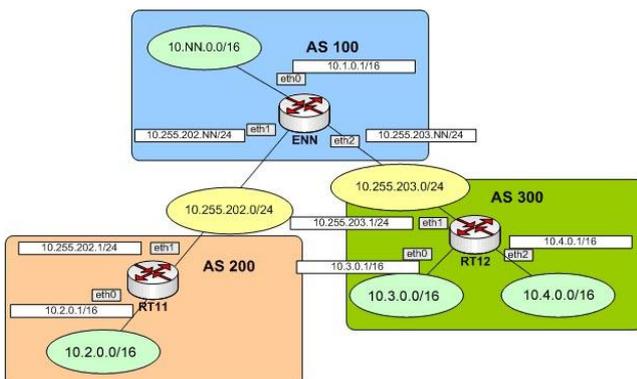


Figure 3. VNLab exercise network topology

Router ENN is to the only computer to be configured in this exercise, two other routers are preconfigured and

function properly. First step is login to router with Virtual Machine Remote Console (vmrc.exe). Access to the virtual machine is remote, via TCP/IP network and server and virtual machine address should be entered usually in format “vmrc://full computer name: virtual server port/virtual machine”, e.g. vmrc://budimir:5900/ ENN.

After this, the authentication on the VNLab server and virtual machine should be completed. After successful login, terminal window shows Linux command line interface.

The configuration of virtual machine for BGP protocol has several steps. First step requires assignment of required IP addresses for router interfaces with **netconfig** command, e.g.:

```
root@RT1 ~# netconfig --ip=10.NN.0.1 --
netmask=255.255.0.0 -d eth0
root@RT1 ~# netconfig --ip=10.255.202.NN --
netmask=255.255.255.0 -d eth1
root@RT1 ~# netconfig --ip=10.255.203.NN --
netmask=255.255.255.0 -d eth2
```

To apply new parameters and assign IP addresses to interfaces command **service network restart** is used, and output should look like this:

```
root@RT1 ~# service network restart
Shutting down interface eth0: [ OK ]
Shutting down interface eth1: [ OK ]
Shutting down loopback interface: [ OK ]
Setting network parameters: [ OK ]
Bringing up loopback interface: [ OK ]
Bringing up interface eth0: [ OK ]
Bringing up interface eth1: [ OK ]
```

In step two, routing software (Zebra and bgp) should be started. It is done with these commands:

```
root@RT ~# zebra -d
root@RT ~# bgpd -d
```

Now, everything is ready for configuring ENN router. Accessing routing software CLI is done with commands **telnet localhost 2605** or **telnet localhost bgpd**. Password is **zebra**.

```
root@RT# telnet localhost 2605
Trying 127.0.0.1...
Connected to localhost.localdomain.
Escape character is '^]'.

Hello, this is zebra (version 0.94).
Copyright 1996-2002 Kunihiro Ishiguro.
```

User Access Verification

Password:

For proper configuration of BGP protocol all networks directly connected to the router should be associated with the routing process (10.NN.0.0/16, 10.255.202.0/24 and 10.255.203.0/24). Configuration is done with following commands.

```
bgpd > enable
bgpd # configure terminal
bgpd(config)# router bgp 100
```

To assign router ID in form of IP address command is:

```
bgpd(config-router)# bgp router id 10.NN.0.1
```

Next, network association with routing process should be defined.

```
bgpd(config-router)# network 10.NN.0.0/16
bgpd(config-router)# network 10.255.202.0/24
bgpd(config-router)# network 10.255.203.0/24
```

In next step neighbor routers should be identified and configuration should be saved.

```
bgpd(config-router)# neighbor 10.255.202.1
remote-as 200
bgpd(config-router)# neighbor 10.255.203.1
remote-as 300
bgpd(config-router)# write
Configuration saved to /usr/local/etc/bgpd.conf
bgpd(config-router)# exit
bgpd (config)# exit
```

To check current configuration command **show running-config** is used and for checking routing table the command **show ip bgp route** is used.

V. EXPERIENCES

During working on these exercises it was not hard to notice advantages and disadvantages of each software product that was used.

OPNET IT Guru Academic Edition has some disadvantages, even though it is one of the most popular network simulation software. It is based on GUI, but it does seem that the visual design was not one of the main priorities on the list. User interface has probably not been changed since the first release of the software as opposed to OPNET Core and IT Guru Core that are maintained regularly. One more remark is about the complexity of features.

Since IT Guru is completely configured using GUI it makes whole configuration complicated and hidden to inexperienced user. The main purpose of this program is to make simulations of complex network topologies, run them with different scenarios and make comparative analysis of given results, but without a need for router configuration through CLI. The key advantage of IT Guru is variety and complexity of simulated networks useful for in-depth analyses. The main disadvantage of the software is lack of real configuration tasks similar to existing system used in real environments.

GNS3 made quite an impression with a combination of creating network topologies in GUI and full emulation of Cisco IOS and other operating systems as well. Network creation is quite simple with the clear graphical presentation. The majority of work is done in router and computer CLI. Since GNS3 runs Cisco IOS images, everything that is available on physical router is available on emulator too. Routers are easily configured by using BGP configuration commands.

VNLab is completely CLI based, without graphical network presentation as GNS3. Therefore it does not give all the possibilities like OPNET IT Guru and GNS3. Network topology is predefined so the focus is on configuring router that is needed. Routers are based on Linux OS, and routing software is Zebra. Zebra uses commands similar to those in Cisco IOS, but they are not completely the same which could be a remark. On the other hand, configuring router was not hard. All the basic features needed for learning and training particular concepts are implemented so the environment is efficient for its main purpose - learning. The VNLab with limitations presented above is still comparable to IT Guru and GNS3. It provides fully open-source environment (unlike GNS3) capable for creating wide variety of networking scenarios that cover numerous computer network courses needs [9]. It also supports much higher level or real experience in working with real systems comparing to OPNET IT Guru due to its focus on node configuration.

VI. CONCLUSION

BGP routing protocol, being the core protocol of Internet, requires network professionals with higher level skills. To compensate high price of equipment and network infrastructure, simulation and emulation software products are used for teaching BGP protocol at universities. For different usage, different type of software is available. Discrete-event simulation software OPNET IT Guru is used for complex network topology comparison and analysis. Emulation software environments like GNS3 and VNLab virtual network laboratory are used for hand-on labs with network configuring and troubleshooting.

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A Metrics Framework for Measuring Changeability of UML Class Diagrams

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Abstract - The growing attention on modeling in software development calls for establishment of quality frameworks and metrics at all levels. The paper addresses the issue of quality model metrics in an early stage, focusing on changeability goal as ability of model to evolve rapidly and continuously. We propose a comprehensive flexible metrics framework, consisting of several model characteristics, capable to adjust to a number of modeling purposes. The framework defines complexity as a key quality characteristic which affects model changeability, viewed as one of modeling purposes. Our approach is illustrated through case studies of UML class diagrams from the practice, measuring corresponding complexity metrics. The first results indicate that degree of model changeability closely depends upon different kind of relationships among classes. The paper points out the necessity of assessing the quality of models built at the very beginning of software design in order to get high quality software artifacts.

I. INTRODUCTION

In today's changing and competitive business environment, organizations are in a constant struggle to obtain dominance in the market. Aware of the fact that information systems and technologies are one of the most dominate technology in the world, they invest substantial financial resources for delivering quality software as their competitive advantage.

The growing attention on modeling in software development has subsequently brought the quality of models in forefront. As a new paradigm, Model-Driven Software Engineering (MDSE) emphasizes the usage of models as primary artifacts when specifying, developing, analyzing, verifying and managing software systems. Models are expected to get more complex with time and their dynamic adaptation to everyday changing environment would be one of the most difficult challenges developers have to face. Therefore, there are a lot of concerns in regard to the quality of models.

Delivering high quality software in an economic way requires control measurements over the products in all stages of its life cycle. It is well known that, in order to develop high quality software system, the focus should be on measuring the quality of the models built at the very

beginning of software design and analysis. As B. Boehm pointed out, unwanted complexity and problems in the artifacts produced in the initial stages have significant impacts on cost to detect and solve them in later stages of development [1]. This observation encourages the assessment of software products in an earlier stage and the paper will be addressing this issue.

In this study we focused on UML class diagrams, the tool for conceptual modeling, as a key artifact of business understanding and clarity. The basic question to be answered is what metric for UML class diagrams can help to assess the quality of early designs. We want to investigate existing metrics, in order to measure quality characteristics which have significant impact on the changeability as today's key model quality goal.

First, literature overview presents the scope of the work done in defining quality frameworks and modeling goals in software engineering. Section 3 presents the interpretation of model quality characteristics through multiple perspectives in IT balanced scorecard framework with focus on future growth perspective. It provides a clear overview of model quality goals as a good basis for defining relevant metric in evaluating changeability. Section 4 examines existing metrics and contains an overview of UML class diagrams metrics regarding model complexity and size. A basic formula for measuring model complexity is given in section 5. In the conclusion, we discuss research outcomes and ideas for future work.

II. LITERATURE REVIEW

The problem of determining software metrics for UML class diagrams is receiving a growing attention. Until now, the greatest number of papers has been focused on defining quality frameworks and comparison of several metrics for class diagrams on complexity, while only a small number of them performed empirical and conceptual studies on the mentioned topic.

The quality of a model can be considered from many different perspectives. Models on different levels of abstraction and different viewpoints have specific quality goals. Claxton and McDougal have come to conclusion that assessing the quality of anything means measuring the right things in the right way, based on its future role

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and purpose. They highlighted the fact that quality model evaluation has to be based on the stakeholders' needs [2]. In this context quality model is defined as "the set of characteristics and relationships between them, which provides the basis for specifying quality requirements and evaluating quality" by ISO/IEC 14598 international standard. In the literature there are many proposed quality models oriented to set of characteristics and sub-characteristic of software quality and ISO 9126 is the one commonly used [3]. Therefore, measurements defined for quality of model should be related to specific quality goals.

Parastoo Mohagheghi, Vegard Dehlen and Tor Neple identified six basic quality goals of models widely used in literature for building high quality models. The most important goals for measuring the quality of models have been identified as correctness, completeness, consistency, comprehensibility, confinement and changeability. These quality goals focus on the quality of models describing the system [4].

The further subject of this research will be a review of existing metrics, model quality characteristics and their assignment to four different perspectives using IT balanced scorecard tool.

III. MODEL QUALITY SPECIFICATION

The multi-view and multi-abstraction level development approach means that each of the diagrams and abstraction levels might require specific quality goals and metrics. "Research on quality in MDE should take into account the various modeling purposes, relations of purposes to quality goals and the dependencies or conflicts between them" is the point that Mohagheghi and Dehlen highlight in their work [3].

Following ISO 9126, the quality model presented by Lange and Chaudron, consists of a set of quality attributes where similar are grouped into a same quality characteristic. They examined the relationship between purposes of modeling and model characteristics, showing influences of lower level concepts on the higher level. This quality model takes two uses into account: maintainability and development. For each phase some modeling purposes are defined and quality characteristics are related to each purpose. In Fig. 1 we can see how these two variables are connected. These characteristics are further related to metrics [5].

The field of research of this paper is the quality of conceptual models, which should be understandable for external stakeholders but not necessarily detailed. Therefore we propose a comprehensive framework for performance evaluation, the IT Balanced Scorecard (IT BSC), through which the vision and strategy of an organization are transformed into a set of strategic objectives and performance measures [6]. Looking through multiple perspectives on the problem we get clear overview of the goals and characteristics as a good basis for defining useful metrics. The originally defined

concept of IT BSC, intended for profit organizations, does not fully suit the needs of software models and it is necessary to adapt balanced scorecard to corresponding stakeholders and business perspectives. The original IT BSC model is shown in Fig. 2.

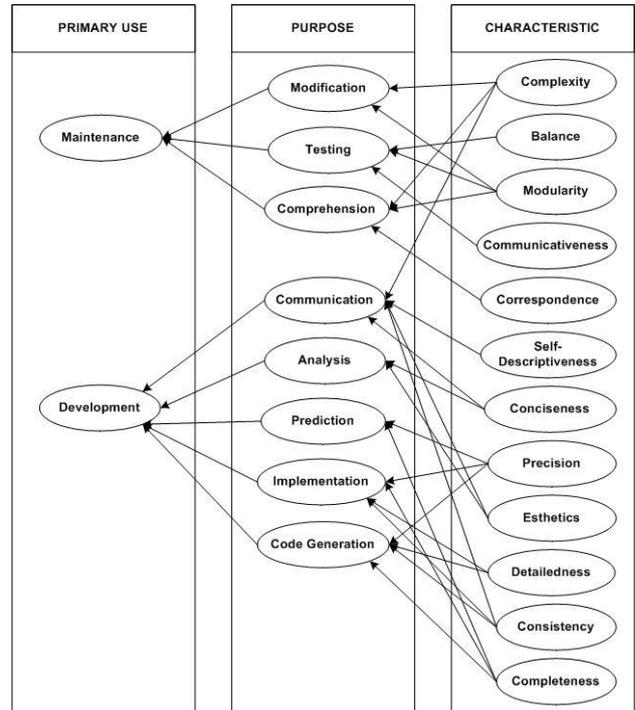


Figure 1: Model Quality

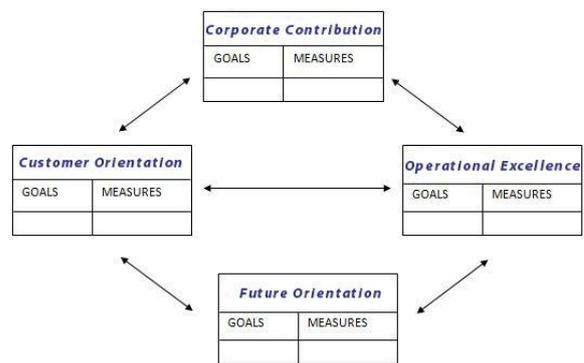


Figure 2: IT Balanced Scorecard

Regarding model quality we introduce the following four perspectives: software designer perspective, client perspective, resource perspective and future growth perspective. The adapted IT BSC model with assigned model characteristics is shown in Fig. 3. Comprehensive analysis of characteristics shows that number of them has influence on more than one perspective goal since they are highly interconnected.

In environments, where business needs and requirements are frequently changed, the priority is to create a model with capability to evolve rapidly and continuously. Significant impact of complexity characteristics on modification purpose is shown on the presented quality model in Fig. 1. Further on we will focus on the changeability goal, covered by future growth perspective in IT BSC, addressing the question how to measure the level of model flexibility to changes.

IV. EXISTING MODEL METRICS

Today, a growing number of companies is using UML as a common language for their project artifacts and has adopted UML as their organization’s standard. Need for measuring their characteristics has arisen, particularly for concrete UML class diagrams as the most important structural models. UML class diagrams play important role in the conceptual modeling phase and their quality can have a significant impact on the overall quality of the system.

Bearing in mind that what we measure and why we measure differs between models and source code, we thoroughly analyzed the existent measures that could be applied to class diagrams at the high level design stage. Although there is a number of metrics and rules in literature, a lack of studies that analyze the quality characteristics of UML class diagrams model on high conceptual level can be noted. Classification of model metrics detected in literature so far can be found in state of the art analysis regarding model metrics [7]. Beside model size and design metrics, a few model-specific metrics related to comprehensibility of models have also been discovered. A case study conducted by Genero *et al.* is one of the rare studies on this topic, where emphasis is given to the size and structural complexity of metrics of class diagrams in order to observe if any connection exists between the complexity and size of UML class diagrams and their maintainability. It confirms substantial correlation between complexity as independent variable and external characteristics of maintainability: understandability and modifiability. The obtained results show that the metrics related to associations, aggregations, generalizations and dependencies, are the most relevant [8].

Concerning these results we can conclude that the changeability quality goal also depends on complexity and size characteristics of a model. Thus we will use presenting metrics in Fig. 4 for overall calculation, where we exclude Number of Methods (NM) and Number of Dependencies (NDep) metrics since they are not suitable for class diagrams on conceptual level. On the other hand, we need to take into account association class element of UML class diagrams, so Number of Association Classes (NAssocC) metric is introduced.

SOFTWARE DESIGNER PERSPECTIVE	CLIENT PERSPECTIVE
Complexity Modularity Consistency Precisions Detailedness Balance	Correspondence Completeness Self-Descriptiveness Communicativeness Esthetics
RESOURCE PERSPECTIVE	FUTURE GROWTH PERSPECTIVE
Complexity Completeness Detailedness Precisions	Complexity Modularity Correspondence

Figure 3: IT Balanced Scorecard for model characteristics

	METRIC DESCRIPTION
Number of Classes (NC)	The total number of classes.
Number of Attributes (NA)	The total number of attributes.
Number of Associations (NAssoc)	The total number of association relationships.
Number of Generalizations (NGen)	The total number of generalization relationships, each “parent-child” pair.
Number of Aggregations (NAgg)	The total number of aggregation relationships, each “whole-part” pair.
Number of Association Classes (NAssocC)	The total number of association classes.
Number of Generalization hierarchies (NGenH)	The total number of generalization hierarchies.
Number of Aggregation hierarchies (NAggH)	The total number of aggregation hierarchies (whole-part structure).
Maximum DIT (MaxDIT)	Maximum DIT (<i>Depth of Inheritance Tree</i>) value obtained for each class. The DIT value for the class within a generalization hierarchy is the longest path from the class to the root of the hierarchy.
Maximum HAgg (MaxHAgg)	Maximum HAgg value obtained for each class. The HAgg value for class within an aggregation hierarchy is the longest path from the class to the leaves.

Figure 4: UML class diagram size and structural complexity metrics

V. RESEARCH RESULTS

Very few empirical studies available on the Internet have been done to measure complexity of models from the practice, in order to assess their ability of adjustments to everyday changes in requirements. For the purpose of examining this quality characteristic, the following relevant case studies were set. In corporation with our industrial partners we conduct research on three existing conceptual models. The models are from different companies with the same domain. They cover supplying and warehousing functions and differ little in model size, which depends on business processes and documents types of each company.

As the basis for measuring complexity of class diagrams on conceptual level, we use appropriate metrics proposed by others which are selected and improved in this paper. Not all of existing metrics are suitable for this level of abstraction and we want to emphasize this fact. As already mentioned, number of methods in class and total number of dependency relationships are beyond the scope of our research. The key elements of class diagram are classes and relations. Essentially, there are three types of relationships: association, generalization and aggregation. They differ in dependency between the classes and therefore it is important to distinguish complexities of different kind of relationships.

Moreover we must not neglect aggregation and generalization hierarchy, which greatly affects the quality of model. On the other hand, aggregation class element plays an important role in model complexity and is necessary to be a part of our metrics framework. Obtained results for each model are shown in Table 1.

From discussion above it is obviously that selected metrics have different influence on the overall model complexity degree. Different degree of their influence has to be concerned. Comparing complexity between metrics leads to characterize them by different weights specified by software decision makers. The reliance on experts' decision is considered very efficient in case of various decision making situations. Expert or group of experts assigns weights to indicators before aggregating them into a composite indicator. Weights should reflect importance of each indicator on composite one. Based on our experience and knowledge we evaluated metrics importance and weights that are presented in Table 2.

The idea is to introduce a flexible measuring framework which will be able to adjust to a number of modeling purposes and case studies by software design experts. No matter which method is used, weights are essentially value judgments and have the property of underlying different effects in the construction of a composite [9], [10].

TABLE I. OBTAINED METRICS VALUE PER CASE STUDY

	Case study 1	Case study 2	Case study 3
Number of Classes	26	31	20
Number of Attributes	119	83	85
Number of Associations	28	17	28
Number of Aggregations	13	7	7
Number of Generalizations	0	10	0
Number of Association Classes	0	3	4
Number of Generalization Hierarchies	0	3	0
Number of Aggregation Hierarchies	10	6	5
Maximum DIT	0	1	0
Maximum Aggregation Hierarchy	2	2	2

Finally the outcome illustrates higher complexity of first model in comparison to other two. Lack of generalization relationships and association classes in first model does not seem to be important here. On the other hand, it makes the difference between second and third model although third model contains greater number of association relations. Therefore, a significant role in overall complexity is also played by number of associations. Despite our belief that they cause the lowest dependency between the classes, in large numbers their impact can be crucial for changeability feature. It should be noted that first model has almost twice more aggregation relationships than others. As we expected slightly variances in model size don't seem to be essential for determining complexity characteristic.

Brief analyses of obtained metrics value verify the importance of dependency level between the classes as the key factor to define complexity, having significant impact on model future growth perspective. Degree of changeability closely depends upon relationships among classes.¹

We use the following formula to obtain complexity characteristic value:

$$C_j = \sum M_i W_i. \tag{1}$$

Where: C_j = complexity characteristic value of individual conceptual model, M_i = metric value, W_i = weight assign to the concrete metric.

TABLE II. EVALUATING METRICS WEIGHTS

Metrics	NC	NA	NAssoc	NAgg	NGen
Weights	0.6	0.2	1	1.4	1.6

Metrics	NAssocC	NAggH	MaxDIT	MaxHAgg	NGenH
Weights	1.4	1.2	1.1	1.1	1.2

Here we show the final results of our research.

TABLE III. MODEL COMPLEXITY CALCULATION

	Case study 1	Case study 2	Case study 3
C_j	99.8	96.3	80.6

¹ Case studies conceptual models are intellectual property of organizations. Therefore their presentation is not given in this research with intention to present some parts of them on workshop.

VI. CONCLUSION AND FUTURE WORK

REFERENCES

In this paper, we analyzed quality frameworks and UML class diagram metrics based on existing literature, providing some initial observations on quality goals through IT balanced scorecard tool. The model covers all of the aspects that influence the quality of conceptual model, underlying changeability goal as essential in software engineering today.

The main contribution of this work is reflecting through the findings obtained from industrial models. The existing metrics regarding complexity of UML class diagrams were examined from different viewpoints, adjusted to conceptual level and different weights in participating in overall calculation of model complexity assigned to metrics.

Considering previous results of structural complexity and size metrics as good predictors of understandability and modifiability model characteristics [8] and based on our findings, we can make final conclusion that degree of model changeability closely depends upon its complexity, particularly upon relationships among classes.

Despite a few number of industrial models applied here, the paper could be a good starting point for further research and case studies. Further steps in this research would be the improvement of overall complexity calculation, the inclusion of other quality characteristics and metrics which are important for assessing changeability quality goal, as well as the determination of each individual characteristics influence degree on final composition with observation of their mutual dependency.

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The Impact of Technology, Internet and e-Commerce on Relationships in the Shipping Industry

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Abstract - The shipping industry shows many of the classic features of a business-to-business market and is interesting because a large number of intermediaries are involved in the day-to-day conduct of business. The objective of this research was to investigate if and/or how technology, the Internet and e-commerce are affecting business-to-business (broking) relationships in the shipping industry. This paper presents the results of exploratory research based on a case study approach that investigates the relationships between ship owners and shipping insurance brokers, and ship owners and shipbrokers (charterer's or owner's broker). The findings indicate that e-commerce has had an effect on business-to-business relationships between a ship owner, a chartering broker and a shipping insurance broker respectively. Internet technology is recognized as an additional enabling means of communication and as a valuable source of information that can allow a broker to provide a more efficient service. The findings reinforce our understanding of the critical role of communication in developing, maintaining and enhancing the social bonds formed during personal interaction in business relationships. They also strengthen the evidence for technology being recognized as an enabler of communication rather than a replacement of personal interaction and trust as a means for doing business.

I. INTRODUCTION

In business-to-business marketing it has been widely acknowledged that buyer-seller interaction often leads to the formation of collaborative relationships as opposed to transactional exchanges. It has also been suggested that relationships improve the effectiveness of business conduct and enhance the competitive advantage of the parties involved. However, the potential of technology to radically alter, or even destroy the need for, relationships is also acknowledged.

The influences of technology on relationships are still very much under-researched and well-supported theoretical models are yet to emerge. It could be proposed that technology is simply changing the dynamics of relationships rather than radically altering them. The objective of this research was to investigate if and/or how technology, the Internet and e-commerce are affecting business-to-business (broking) relationships in the shipping industry.

II. INFORMATION TECHNOLOGY AND THE SHIPPING INDUSTRY

Relationships between companies tend to be characterized by close working, mutual commitment, trust and adaptations. The application of any form of IT inevitably removes the need for continuous face-to-face contact and as a result technology has been known to have a significant impact on relationships. However, it has been and still remains an issue of considerable debate whether the impact on relationships is largely positive or negative, i.e. whether IT-and the Internet in particular is removing the need for interpersonal relationships, or whether its application is a means for enhancing them.

It is often suggested that the Internet will eliminate intermediaries from the supply chain, a process usually referred to as disintermediation. Disintermediation has been discussed at length in the context of shipping brokers. The application of e-commerce platforms is recognized to have both benefits and drawbacks, including issues about the future role of intermediaries [1].

Within the shipping industry a vast number of e-chartering companies emerged and on-line charterers argued that they were in a position to help the industry by offering greater efficiency in the control of the information and business process. It seemed as if e-chartering was going to replace traditional chartering, i.e. replace the brokers. However, during the year 2000 the 35 Web start-ups in this area failed to build a working product, leaving only a few players in the arena who were at the time struggling to survive [2]. Another area where one would have expected the formation of an e-platform but which has not yet occurred is that of shipping insurance [3].

To date the results of research investigating the impact of technology on relationships are inconclusive and thus the area needs further investigation. Such a broad research arena demands an exploratory research framework and thus the following research questions - which have specific reference to the shipping industry - have been developed:

- How different parties in the relationship perceive the contribution of technology?

- How have technological developments affected relationships between the brokers and the ship owner?
- To what extent are e-commerce policies being introduced in the shipping industry, specifically with reference to chartering and insurance broking?

III. RESEARCH BACKGROUND

The shipping industry shows many of the classic features of a business-to-business market and is interesting because a large number of intermediaries are involved in the day-to-day conduct of business. It has been described as an industry whose whole existence is founded on the development of relationships and effective communications [4]. For a single voyage of one vessel a ship owner/principal may be dealing with a large number of other principals and usually deals between principals take place through the involvement of intermediaries, referred to as either agents or brokers. Two such dyadic relationships in the shipping network are those that are formed between a ship owner and a shipping insurance broker, and a ship owner and a chartering broker.

This paper presents the results of exploratory research based on a case study approach that investigates the relationships between ship owners and these two different types of shipping brokers.

IV. METHODOLOGY

This research is exploratory and, therefore, a qualitative study was conducted. The form of the research strategy was that of a case study and the study was more concerned with describing real world phenomena than developing normative decision models. Two separate case studies were undertaken and the data collected was analyzed.

Three different companies were involved in the research: a shipping insurance broking company - Willis Limited, a chartering broking company - East Mediterranean Trading & Shipping Inc., and a shipping company - Crnogorska plovidba A.D. Kotor.

V. RESULTS

The research results are presented below, as a summary of the findings from the in depth interviews.

A. *The effect of e-commerce on the business relationship between an insurance broker and a ship owner*

The informants from the owner's side consider that technology has made an important contribution to communications within the industry. With the introduction of new technological developments communications have become a lot easier, much faster and less costly.

The broker stressed that the contribution of technological developments to the industry cannot be contested, as they have enabled faster communications.

The informants believed that the Internet had made relationships less personal because e-mails involve typing which is necessarily less personal than talking whether on the phone or face-to-face. The Internet was perceived to have made relationships more formal because it has increased the amount of paperwork involved

Finally, the informants felt that the Internet has significantly increased the number of tasks they have to do at any one time. For instance, a telephone conversation needs to be backed up by a fax and, in recent times, by e-mail as well. Furthermore, the information load has increased and any information received needs to be scanned before it is discarded.

The ship owner did not perceive the effect of the Internet on business relationships any differently to the effect of previous technological developments such as the mobile phone. Internet technology seems to be largely conceived as an additional means of communication with an extra function of providing the ability to trace more information that is very cheap but far less personal. The ship owner agreed that relationships could not be created and maintained solely through the Internet.

The broker suggested that as long as Internet technology is used as a tool to help the development of business formed out of a relationship then the Internet could have a positive effect on relationships.

The ship owner had serious difficulties imagining how shipping insurance broking could be conducted through an on-line platform. The main reason that he stressed was the risk if a vessel was not correctly insured, which could lead to financial disaster. On-line platforms were perceived as too impersonal for an owner to have confidence that no problems would occur and furthermore there are still serious problems with respect to the trustworthiness of the Internet as a means for conducting business overall.

The broker believed that shipping insurance broking could not be conducted on-line because marine insurance is not mass-produced like other insurance forms and it is customized to each individual owner and to each separate vessel. Moreover, a vast deal of preparation and interaction, which requires specific information, takes place between the parties before a contract can be formed, and face-to-face contact is a prerequisite before any dealings take place.

B. *The effect of e-commerce on business relationships between a chartering broker and a ship owner*

When the chartering broker was asked about the contribution of technology to the industry he regarded the question to be specific to the contribution of the Internet to the industry and therefore, his answers have specific references to the Internet. He considered the main contribution of the Internet to be the provision of a vast deal of information, which has allowed brokers to provide a better quality job.

The chartering broker felt that the Internet has not had a significant effect on business relationships. He maintains that relationships were well in existence and functioning before the appearance of the Internet and email.

He perceives the only contribution of the Internet to business relationships as an additional mechanism for communicating with people.

The ship owner had the opinion that chartering broking is much too complex to take place only over the Internet. Moreover, he stressed issues of security and imbalance of power between the two principals. He perceived that on-line systems could be easily hacked and also felt that the use of such platforms would leave ship owners at the mercy of the charterers, as transparency gives charterers the ability to push rates down.

According to the chartering broker, fixing vessels on-line is obviously a possibility since it has been taking place for some time now. However, as far as the informant knows the use of such platforms also involves brokers. He believed that these platforms had not been adopted as widely as expected because they were not functioning properly. They are not secure enough and in their present form they seem to strongly represent the interests of the charterers and not at all the interests of the owners.

The ship owner and the chartering broker considered that e-chartering had created a serious threat to the chartering brokers as it theoretically allows for the two principals (owners and charterers) to deal directly with each other without the involvement of intermediaries. The chartering broker noted that these platforms were not perceived very kindly by the brokers at their outset because they were claiming that their purpose was to remove the broker which, according to the informant, was a bad policy because it immediately turned the brokers against these platforms. The informant also specified that these platforms have so far failed to produce a working product that will make the charterers, the owner's or even the broker's role a lot easier.

VI. DISCUSSION

In the discussion below the manner in which the results relate to the research questions will be presented.

A. *How is the contribution of technology perceived by the different parties in the relationship?*

The contribution of technological developments to communications was stressed by all of the informants. However, whilst brokers stressed the aspect of availability of unlimited information through Internet technology, which empowers their knowledge of the market, the ship owner placed higher emphasis on continuous communications with the different parties permitted by the use of mobile phones.

This imbalance in perceptions between the two sides could be conceived as indicating the different nature of the two parties involved in the dyadic relationship. A broker needs to be well informed because it is his/her expert knowledge that provides the value which he has to offer to the relationship while the ship owner needs to be in continuous communication with the broker in order to obtain the most recent and updated information. In a sense the broker acts as the eyes and ears of the ship owner in the market that he is operating.

B. *How have technological developments affected relationships between the brokers and the ship owner?*

With respect to the effect of technological innovation on business relationships between a broker and a ship owner, the only clear cut conclusion that can be drawn is that as long as the social aspect of the relationships is not removed when new technologies are introduced then the contribution can be either neutral or positive. Brokers feel that technological developments have enhanced the quality of the services they provide but have not improved relationships. The ship owner, on the other hand, takes a more neutral stance and believes that provided sufficient face-to-face contact exists the contribution of technology is not negative although if technology is used as a replacement for face-to-face contact its contribution is perceived to be negative.

These findings suggest that the impact of technology on relationships is not as clear-cut - it can be positive, it can be negative or it can be neutral. It follows that the contribution of technology to business relationships may be highly dependent upon the industry in which it is applied and it may also vary according to which side of the relationship one investigates and this is a distinction that theorist will need to consider before drawing clear cut conclusions and making generalizations.

The research findings suggest that the Internet and its applications have altered the nature of relationships rendering them less personal, more formal and more task-oriented. However, the written word is generally conceived to be less personal than telephone conversations, where audio cues are involved, and certainly less personal than face-to-face contact, where both visual and audio cues are directly involved.

The research also suggests that in the shipping industry Internet technology in itself is not used as a means of protecting relationships. It is seen as a tool to enhance communications. In the shipping industry new IT based communication is not used as a replacement for traditional means of information exchange; rather it is used as an additional mechanism.

C. *To what extent are e-commerce policies being introduced in the shipping industry, specifically with reference to chartering and insurance broking?*

The commitment of the companies that took part in the research to integrating e-commerce policies can be considered to be relatively low. All companies that participated in the research had a web site but it was found that the implementation of their web sites does not go beyond that of virtual brochures. An explanation for the non-application of e-platforms on shipping insurance broking could be the amount of trust assigned to each kind of broker, which suggests that the main reason for increased interaction between companies in business-to-business markets is the need for security, privacy and reduced risk.

The findings of the research suggest that the advent of new technology has decreased the frequency of face-to-face interaction between individuals in companies, making

the resolution of problems difficult, increasing uncertainties and making relationships more difficult to manage.

Therefore, future theory on the application of e-commerce should pay close attention to the level of risk involved in business conduct before suggesting the removal of the personal aspect and its replacement by impersonal on-line platforms.

VII. CONCLUSIONS

The findings indicate that e-commerce has had an effect on business-to-business relationships between a ship owner, a chartering broker and a shipping insurance broker respectively. Internet technology is recognized as an additional enabling means of communication and as a valuable source of information that can allow a broker to provide a more efficient service. If parties are satisfied they engage in repeated business, repeated business means increased interaction and increased interaction brings the two parties closer together.

While Internet technology may not be able to function as an intermediary in shipping because it is lacking the direct human element that ship owners require, it has, however, additional values to offer, such as speed and more information. These values need to be recognized by the brokers and Internet applications will have to be incorporated into the traditional role of the broker. Therefore, it appears as if in the shipping industry the

application of Internet technology is going to be realized in improved ways of performing old functions rather than in the creation of totally new products that have totally new values and which threaten previous technologies, products and service providers.

The findings strengthen the evidence for technology being recognized as an enabler of communication rather than a replacement of personal interaction and trust as a means for doing business.

Finally, the findings show that business relationships and networks are still paramount in the shipping market. However, both academics and managers should recognize that technology is a tool and consider how it can be used to enhance existing strategic relationships and gain competitive advantage.

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Sales Management on the Internet

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Abstract -This paper presents content management system as a support for Web auctions software. Paper describes types and elements of web auctions. Business model with use case and activity diagrams of a web auction is described. Universal model, software architecture and an example of implemented content management system as a module of software for web auction software is presented.

Summary

Internet auctions are very popular means of business. Auction sites take the central part of many Internet sites and pages, and are one of the significant segments in electronic business with constant increase of sales. Business model of a web auction includes biddings for a product or a service via the Internet. Functionality of selling and buying in auction format is made possible in form of an auction software for regulating various processes of an auction. Strategic advantages of a business model of web auction: there are no time limits; there are no geographical limits; intensity of social interaction; large number of bidders; large number of auctioneers; sellers and buyers network; value of the system increases with the increase of the number of users; captures consumers' surplus. CMS is a software system which helps users in the process of content management. Web CMS is content management which makes publication of web content, i.e. contents of a site easier. Most systems enable access control to different levels of users, such as administrators, users, content creators. Access is usually made via web browser programs. CMS of a web site is often located on the site server. Most systems enable access control to different levels of users, such as administrators, users, content creators. Access is usually made via web browser programs. Auction CMS is a software which controls all aspects of a web auction functionality. Web auction application consists of two parts: front end and back end for administration. The implemented solution is based on universal model of web application that support an auction of any product or service. For different usage aspects, the model requires minor changes in the field of payment verification and receiving goods.

Key words: Sales Management, Internet

I. INTRODUCTION

Internet auctions are very popular means of business. Auction sites take the central part of many Internet sites and pages, and are one of the significant segments in electronic business with constant increase of sales. One of the reasons for its popularity is that it allows customers to compete, and salesmen to achieve maximum price. Besides, offer of goods is extremely large and various and at the global market there are always customers to be

found. Other reasons for popularity of Internet auctions are free price setting and simplicity of work – it is enough to take a photograph of the item and describe it, and it already exists at the global market, without a single actual movement. All this has created almost ideal conditions for Internet auctions as one of the best businesses. The term auction originates from Latin “auctus”, which means “enlargement”. The Latin origin of the word explains why this method of trade has gained such popularity. In cases when the ratio between supply and demand is such that there are more goods than customers, or when for goods there are no customers, the prices decrease.

II AUCTION TRADE

“Auction is a formalised trade procedure in which trading partners follow specific rules. Auctioneer acts as a middleman in this trade“ [1]. Electronic or Internet auctions are only a special form of mediation. There are two modality of selling and buying at auctions. First is when a seller starts the process by offering goods and a minimum price, and lets buyers compete to achieve maximum price for the goods. During an auction, while selling goods, a seller offers goods, states the quantity and the minimum price, as well as conditions of trade. Buyers make bids and the price increases until it reaches certain limit where the most advantageous bidder pays the highest price and gets the goods [1]. Second modality of auctions is starting when buyer states the need for certain goods. Buyer specifies what he wants to buy and the sellers or producers give offers for prices. In this case the price is minimised so that the one who offers the lowest price gets the bid. This way of trading is common for supplying process in some big companies. The procedure requires getting minimum three offers from different producers or suppliers in order to minimise costs. Depending on the point of view, auctions can be:

- Coordinating mechanism - for determining relation between supply and demand for a specific product.
- Social mechanism – for goods or objects representing status symbols it is difficult to determine a real price as it is the domain of irrational and cannot be measured. Such goods are rarely sold and potential buyers in such occasions are ready to pay enormous amounts.
- Efficient mechanism of allocation – In cases when services are sold in the last moment (such as plane tickets before the plane takes off), or goods nearing expiry date. Elements of auction trade are:

– Auctioneer – who is in charge of providing institutional frame for undisturbed auction and should make sure all auction phases follow defined rules. Phases are: information exchange, setting prices, actual trade and payment.

– Before commencing any auction trade, rules must be strictly defined and followed to the detail. Disregard of rules directly influences the reputation of an auction house, leading to loss of reputation and trust among clients.

– Objects of trade – Various objects are subject to trade in auctions. Depending on the object of trade, there are differences in trading conditions.

– Trading on the Internet requires a high level of standardisation in describing products. Bearing in mind that trading objects can sometimes be very complex, additional explanations can be needed, whereas sometimes can require precise expert explanations.

– Trading rules – Must be established and defined in advance. Rules themselves depend on the type of goods to be manipulated in trade.

– Transaction process – Includes shipping and delivery of goods as well as the process of payment. Proper treatment of this part guaranties a proper completion of the whole procedure.

Types of auctions:

– English type of auction – Type most commonly used in English auction houses Sotheby's, Phillip's and Christie's. An auctioneer starts the sale offering the lowest acceptable price. Participants make a bid after bid, each time increasing the price in comparison with the previous price. The auction is closed when no participant bids higher price than the previously set one, or, in case that the previously set purchasing price was reached, then the next highest bid wins. A seller can set a minimal price, and, in case the minimal price was not reached, the object is not sold. There are three methods of increasing price during these auctions: auctioneer increases the price step by step, buyers make bids, or the combination of the two.

– Dutch type of auction – In traditional Dutch auctions, auctioneer sets a high price which is gradually lowered until some of bidders accept the auction price, or if previously set minimum price was reached. The winner pays the last declared price. Dutch auction is used for a description of on-line auctions, where several identical objects are sold simultaneously to equal number of strongest bidders.

– Silent auctions (first price bidding) – In this type of auction bidders simultaneously submit sealed bids, so that other bidders do not know what price is offered. The highest bid wins. In this type of auction it is possible that more bidders offer the same price. This type of auction consists of two parts, first when the bidders submit their bids, and the second when the bids are opened and the winner is decided. Potential problem in this type of auction can be the existence of more items in auction, or the number of winners. If there are more items in auction, not each winner will pay the same price, but the first will pay the highest price, and all the others – lower prices.

That is why this type is a so-called discriminatory. This type of auction exists in the USA, where the state, in this way, sells its debts.

– Vickrey auction type – Named after William Vickrey, Nobel prize winner in 1996. Auction is carried out in such way that the bidders submit their sealed bids, without knowing what the bids of other bidders are. The highest offer wins, but the price is determined on the basis of the first lower bid, which is in fact paid. If there are same items on sale, all the rest are sold at this price ("the highest losing price"). The idea of this method is to reduce the drawbacks of the previous models when more items are on sale. In the previous model the prices move from the highest to lower. In this model, not the highest price is paid, but all the rest are equalised, which leads to general increase of income. Besides, the bidder suffers no mental strain that he will pay the highest price which would not be reasonable. It is especially important that the bids are sealed because otherwise auctions would be easy to fake. This type of auction is eBay (www.ebay.com).

– "Auction cut" is a process of monitoring an on-line auction with a time limit, i.e. on eBay or Yahoo!, and putting a winning bid in the last possible moment, often literally in the last second of the auction, so that other bidders cannot surpass the last bid. Some bidders use software designed specially for that purpose, such as Auction Sentry and Ebay Sniper.

III Web sites for auctions

Systems of work on auction sites partially differ from one site to another, but the main principle is much the same. A visitor who wants to take part in an auction has to register on the site first, and then gets a username and password. If he only has the intention to browse the site, the registration is not necessary. When the seller registers the sale, he determines the lowest price for his goods. In some cases there is an option that the starting price is not set, but then the time limit for the auction process must be given. Goods are sold at the price reached during the defined time frame. In some cases the maximum amount is set within which the price could be increased. From advertising point of view, each seller is trying to present his product the best he can, so that each auction object is accompanied by product description, its picture or additional explanation. Different options are available for users. One is that the price increases automatically, as soon as somebody makes a better offer. Normally, there is a possibility to limit the offered amount. On some sites it is possible to attend at all auctions connected to a certain product. One of very useful services is communication with other registered site users, either by e-mail or at forums. As this trade segment is constantly developing, it is to be expected that the number of available services for traders and users will continually grow. [2] So many sites deal with auctions and auction sales and they can be considered one of the most expansive businesses on the Internet. There are many reasons for that [1]:

- Communication infrastructure with millions of potential buyers and business partners and possibility of global performance.
- Standardized hypermedia presentations of trading objects enable simplified description of the product.
- Development and spreading of standard searching mechanisms are independent from auction business and do not present extra problems.
- Payment systems are mostly developed and safe enough. If payment is made through a safe system of credit cards, there are almost no risks for the user. Besides, it is possible to make financial transactions on the sites which guarantee quality and safety, which increases the level of confidence. Auction is a process of selling and buying goods and services presented as an offer for bidding. Selling is performed to the bidder with the highest offered price. Auction is a method for establishing price of goods with uncertain or changeable price. Auction usually starts with a price for the minimum value of the product, bidding must continue with a higher price in order to find a buyer for the product. Auctions which do not have a starting price guarantee sales and the bidding process sets the price of the product.

IV Business model of a web auction

Business model of a web auction includes biddings for a product or a service via the Internet. Functionality of selling and buying in auction format is made possible in form of an auction software for regulating various processes of an auction. A typical example of a web auction is eBay, the biggest web auction site on the Internet in the world. As most of the companies, eBay does not actually sell goods, it processes information and presents goods, enables bidding as well as payments. eBay has a function of a market for private and legal entities, i.e. companies, which use the site to put their products and services at auction. There are several types of auctions possible on the Internet, English type, Dutch type and their variations. Almost all Internet auctions use the English auction type. Strategic advantages of a business model of web auction:

- There are no time limits – Bidding can be made at any time of the day, twenty-four hours a day, seven days a week. Products are exhibited for several days so that the buyers can have time for browsing, and to enable them to form their offers. This advantage drastically increases the number of biddings.
- There are no geographical limits – Seller and buyer might interact regardless of their location, the only prerequisite being access to the Internet. This advantage increases accessibility and lowers the costs of presence at auctions, which leads to increase in the number of auctions as well as buyers. The goods purchased do not need to be transported to a central location but directly from the seller to the buyer.
- Intensity of social interaction – Interaction of people involved in the auction process is very similar to gambling. Buyers, i.e. bidders wait for the decision of the

auctioneer to announce the winner (eBay actually calls the buyer a “winner”).

- Large number of bidders – Due to potentially low price, a large number of products and services available, easy access and social gain from the auction process, there is a large number of bidders.

- Large number of auctioneers – Due to a large number of bidders, potentially high prices, lowering sales costs and easy access, there is a large number of auctioneers.

- Sellers and buyers network – Large number of buyers automatically attracts a large number of sellers, which forms a virtual cycle: more buyers means an increase in the number of sellers, which leads to an increase in the number of buyers and so on. Value of the system increases with the increase of the number of users. Captures consumers’ surplus – Auctions are a type of the first level of price discrimination, and as such have a tendency to transform the saving of the buyer into the profit of a seller. Web auctions, are an efficient way of discrimination in setting prices.

V Content Management System (CMS)

CMS is a software system which helps users in the process of content management. Web CMS is content management which makes publication of web content, i.e. contents of a site easier. Web CMS is often used for input, control and publication of certain documents, such as news, manuals, marketing brochures, product information etc. [3] CMS of a web site is often located on the site server. Most systems enable access control to different levels of users, such as administrators, users, content creators. Access is usually made via web browser programs. Content creators load the information into a system and the system administrator is in charge of all information circulating through the system, he allows it, censors or rejects it. CMS controls and helps each step of an operating process, including technical operations of publication of documents to web sites. The complete content and other information related to a site are stored in a relational database. Auction CMS is a software which controls all aspects of a web auction functionality. This CMS must follow auction and sales logics by certain model. ACMS controls the input on new users, i.e. their information, process of opening and running an auction, bidding, processing the winner of an auction chosen by auctioneer, sending data relevant for payment to a third party application for processing and verifying payment, and after payment verification ACMS approves of, or informs the auctioneer that the payment has been made. Web auctions are based on web technologies. CMS-module is a web site section autonomous from the rest of the system and it is integrated into a system, i.e. added to other modules which together form a whole system. The logic of an Internet auction itself is simple. CMS on users side must have following basic functions: to frame all the sections which are connected to direct influence of visitors on the system and its content, that is: protection from unauthorized access, opening auctions and bidding

Figure 2. User registration form

registers for the site and is allowed to participate completely in the process of auction and bidding. He can put pictures on the server, open auctions, sort the photographs, have access to all biddings and auctions. To put a picture on a server it is necessary to fill in the form for upload of photography. It is important to fill in the field representing price, which is, as in English type of auction, a starting price for bidding. In the end, it is necessary to provide the right path to the location of the photograph. During the upload process, type of photograph is checked. While uploading the photograph, the application automatically generates a small size picture which appears on the site and can be seen by all members. This solves the problem of upload of the original and small size picture, which the user would have been supposed to make himself and which could have a negative impact on simplicity of use of the application. After the successful upload of the photograph on the server, alteration can be made to the description and starting price. Photograph can be deleted from the server, or an auction opened. To open an auction, a closing date for the auction should be chosen. Once opened, there is an option to temporary close and reopen the auction unless the closing date has not expired. It is possible to delete an auction, but it is previously necessary to close it. When an auction is deleted, another can be opened, data can be changed or photographs can be deleted from the server. Bidding (Figure 4) is performed so that the members compete who will offer a higher price. Auctioneer does not have to choose the highest price, he chooses by his own criteria and can choose the highest as well as the lowest offered price. It

is not possible to make bids lower than the starting price. If the auctioneer has chosen the winner, the auction is closed and marked as an auction with a winner. If the auction exceeds the time limit and the winner of the auction has not been chosen, information is received that the auction elapsed. When the auctioneer establishes the winner, he allows buying and the buyer receives a message that he won the auction and is asked if he wants to proceed with process of payment. In case the buyer decides to make a purchase, after the payment he gets access to take over the photographs. If the winner of the auctions decides not to buy and the bidding time has not elapsed, the auction is continued and the bidding which won but quitted is marked as such. As the auction is continued, auctioneer can choose another winner so that setting prices and sales are more likely to end in purchase. This application is session based, i.e. it uses cookies that are placed on server. For security reasons standard cookies on user's local are avoided, which means that memorizing login parameters is not possible. The application uses one-way irretrievable cryptic MD5 and a random key which can be changed. MD5 Hash function - Hash function includes mathematical functions which, based on input message generate values of fixed length, so called hash value, *message digest*, or *message fingerprint* incoming messages. Result of a *One-Way-Functions* is a *digest* of 128 or 160 bits.

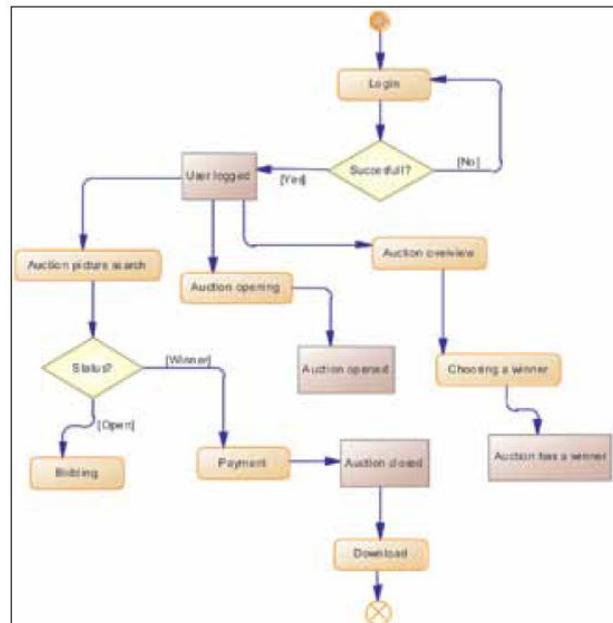


Figure 3. Activity diagram for opening auction

It is practically impossible to get two identical *digests*. This technique of data integrity check is very reliable [4]. Parameters defining a page and its functions are cryptic so that the user on URL path never sees the exact title of the page. The great problem of transferring data related to users from one page to another by sessions is solved using one-way cryptic solution of user id in database, password, e-mail, session_id, which form a character line defined as 'uniqueid'. Each new log-on generates different 'uniqueid' from the previous, so that the user is allocated a 'uniqueid' which is valid as long as his

session. Each page checks the authenticity of data from session against database and allows or restricts access to protected content accordingly. Photography upload is processed when path to photography is confirmed. First, the photograph title is checked against allowed characters and if it is of adequate type, and the requirements being fulfilled, dimension (height and width) of the photograph are detected and put into user's directory. If the allocation of the photograph is successful, all the details about the photograph are entered into a database and method for generating small size picture to be seen on the site is used. Dimensions of a small size picture are defined in config.php file. As the application itself has to generate a small size picture out of the original, problem of black picture usually occurs during this procedure. Namely, this problem appears when temporary data on photograph tmpName is used or if the photograph has not been allocated to the right address. This problem is solved so that instead of using tmpName as a temporary allocation on a server, the photograph is first allocated and then its absolute path is taken. Application supports only one language option, being aimed at the global market where English language is expected and where multilingualism would lead to multilingualism of auctions, which would confuse the users. However, at the administrative part there is an option for change of language.

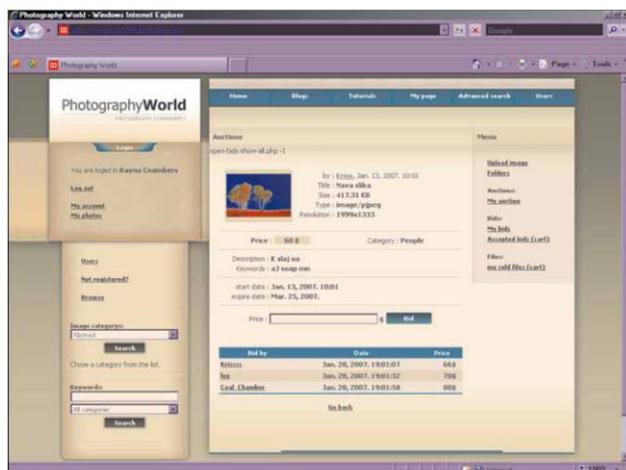


Figure 4. Web page for bidding

If the application is aimed at a local market, it is possible to change the language if it is expected for a user to open auctions and provide descriptions for photographs. That is why the application has a separate file which contains all the titles and all the texts and allows the possibility of translating into any other language.

VII Conclusion

The aim of this work is to present theoretical aspects, models and implemented web application for auctions software support. Basic elements of auction process are described. Different aspects, modalities, types and

mechanisms of auctions are presented. Characteristics of web sites that are used for auctions are described. Business model of web auctions is explained. Examples of existing web auction sites are presented. An architecture of web auction software, as well as content management systems as its module is explained. The implemented solution is based on universal model of web application that support an auction of any product or service. For different usage aspects, the model requires minor changes in the field of payment verification and receiving goods. Most "third party" applications deal with this problem by using services of www.PayPal.com which in the payment process keeps the money paid in "quarantine" until the buyer confirms the receipt of goods or services. Future improvement of implemented solution could include: scoring member services and ranking members by reliability, possibility of making comments, "feed back" on experiences of doing business with sellers and buyers, as well as extending auction types.

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An Example Design of the Software Defect Registration Process Improvement

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Abstract - Registration of software defects is very important, whether it is done in the software development phase, testing phase, or after deployment in the production environment. When software is deployed in the production environment, it is assumed that the software already passed intensive testing and is robust enough to be deployed or installed. Software testing is a complex and expensive task, and the number of possible combinations can quickly become so large that testing of all combinations would require enormous amounts of time and resources. That is the reason why most of testing is focused to prove that required functionality is implemented and is working as expected under controlled environment conditions and under a certain process workflow. This also means that delivered software is not free of defects and defects can occur any time. The first and most important step is the correct registration of the defect and the circumstances under which the defect occurs. Unfortunately, word processors or spreadsheet applications are still the most used tools for defect registration. Although the use of these tools can be very easy, the defect history, the attachments of supplemental data important for defect understanding, and the reporting can all be serious issues. This paper presents an example design that can significantly improve this process and solve issues in the defect history, attachments management, and reporting.

I. INTRODUCTION

“Be careful about using the following code — I’ve only proven that it works, I haven’t tested it,” (Donald Knuth).

When software is deployed and is running in the production environment, the development project phase is replaced by the maintenance phase. The maintenance phase is responsible for the correction of defects and wrongly implemented functionality. When an error or failure occurs, the first and most important step is the correct registration of circumstances and workflow that can help to regenerate the same error or failure in the Test and Development environment, as well as provide as much information as possible about used data. Although this is not always possible due to an error or a failure caused by data and data quality in Development, Test, and Production environments can be significantly different, it is always important to collect as much information as possible about an error or an failure.

Definitions of an “error” and “failure” differ. An error is defined as “*the state or condition of being wrong in*

conduct or judgment” or “*technically a measure of the estimated difference between the observed or calculated value of a quantity and its true value.*” [1]

A failure is defined as “*lack of success*” or “*the neglect or omission of expected or required action*” or “*the action or state of not functioning.*” [2]

Even the definition of defect differs, both, an error and a failure in this document will be called a defect.

A defect is “*a shortcoming, fault, or imperfection*” or “*lack or want, especially of something essential to perfection or completeness.*” [3]

A defect is very often understood as a wrong requirement implementation. There is also another term used for software defects, known as a bug. A bug is a defect in the software code, or an unexpected and unforeseen behavior of the software. Bugs can range from simple defects, such as cosmetic or formatting issues, to very serious issues that can cause an application to crash.

The first part of this paper describes a business process workflow where defect registration is supported by word processing and spreadsheet applications.

The second part of this paper presents an optimized and automated process workflow and tools that can provide effective registration, data collecting, and reporting.

II. RELATED WORK

Most of the available papers and articles related to software defect tracking analyze the effect of software defects on the product development cycle [4], present different defect-tracking metrics [5], analyze the effects of defects on the cost of software ownership, or give an overview of the best practices for defect tracking [6].

The prediction of the number of defects is a separate topic and number of defects depends on the project size, number of developers, and schedule pressure. [7]

The impact of defects is not necessarily proportional to their quantity. Some types of defects have a much higher cost to fix due to either: customer impact, time needed to fix the defect, or the wide distribution of the software in which they are embedded. [4]

When a defect is discovered, it needs to be registered and then assigned to a developer who is responsible for

the correction. Assigning the defect to the correct developer can be a time-consuming process, especially in cases when large number of defects is reported. To reduce the effort of assigning reports to developers, most companies incorporate a semi-automated approach using a machine learning algorithm in the open bug repository to learn the kinds of reports each developer resolves. When a new report arrives, the classifier produced by the machine learning technique suggests a smaller number of developers suitable to resolve the report. [8]

The best practice for defect tracking recommends the following fundamentals, [9]:

- Information Capture – minimum amount of information necessary to report defect,
- Reproduction – possibility to reproduce defects and verify correction,
- Prioritize and Schedule – decide in which order defects are corrected,
- Communication – between a defect reporter and those responsible for fixing,
- Environment – some defects exist only in a specific environment.

While this list can be used to start a discussion about defect tracking and is considered the guidelines for software defect tracking tools design, these fundamentals do not provide any idea how such an easy tool can be developed. For example, although Lisa A. Curhan [4] did extensive research on the SUN Microsystems defect tracking database that was 22 GB in size and suggested important improvements, we were not able to find out any information about database design and structure.

In this paper, the primary focus is on encouraging a support team design to replace error-prone and time-consuming word processors or spreadsheet application defect registrations via a database-based solution.

Due to the space limitations, we were unable to present a full design, but we can demonstrate how simple it is to start with development and how easily the existing solution can be extended by adding new information and functionality.

III. DEFECT REGISTRATION BY USING WORD PROCESSOR OR SPREADSHEET

Figure 1 illustrates what is probably the most used version of the Software Defects Registration (SDR) process workflow and is based on the dedicated mailbox where all users can report defects by simply sending an email message.

Defects are usually registered with the help of a word processor or spreadsheet. For example, it can be created using Microsoft Word or Open Office Writer word processors, or Excel or Open Office Calc. spreadsheets.

In cases where there are fewer defects, these applications are sufficient. Spreadsheets usually offer improved sort-and-search functions and built-in script support, and usually are a better choice over word processors.

The following picture, Figure 1, is the basic process workflow in cases where unexpected software behavior occurs and application support teams should be notified:

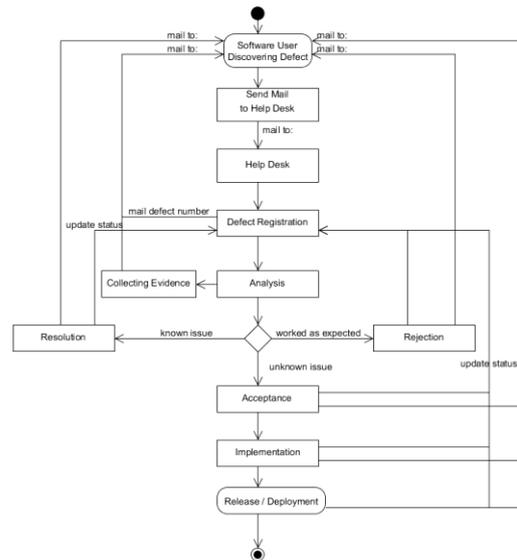


Figure 1 Problem Description

The above picture represents the typical process of defect reporting, registration, and correction.

Figure 2 is visual representation of the reporting, registration, and correction workflow:

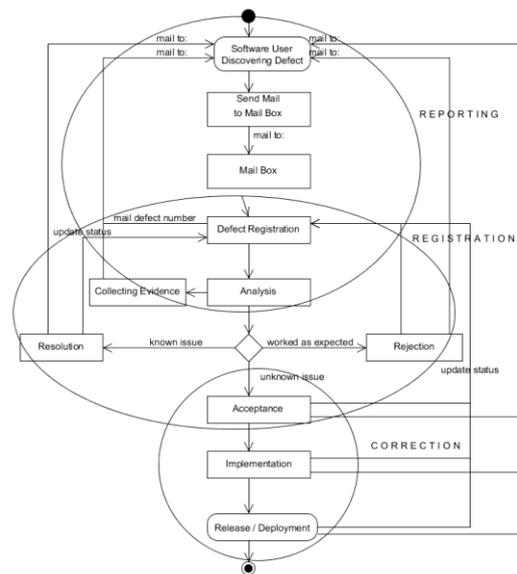


Figure 2 Defect Reporting, Registration, and Correction

In Figure 2, some of the processes overlap, which is quite normal because both reporting and registration workflows require an execution of the Collecting Evidence process, as well as an Analysis necessary in cases of defect registration and defect correction workflows.

The correction of defects is out of scope for this project. The correction of a defect involves developers and architects, and requires separate planning, resource allocation, development and testing, Q& A procedures, and workflow that can be very complex, even in case of very small software changes. This is the reason why the Correction workflow is represented by the three birds'-eye view processes: Acceptance, Implementation, and Release/Deployment. However, the life cycle of Defects cannot be complete without the accomplishments of these processes. Outcomes from these processes affect Defect Registration and change the Defect status.

Maintaining the Defect status is very important for planning and reporting, as well as for resources allocations and any other kind of analysis.

A. *This Model's Issues*

What stands out foremost as an issue of this model is the fact that this model introduces communication overhead. All communications are accomplished by exchanging mail messages. Mail messages are used for Collecting Evidence and for informing the User of any kind of changes that affect Defect Registration, such as an update of defect description, defect status changes, or any other additional comment that can appear during analysis phase.

Another issue of this model is that in some cases the word processor or spreadsheet applications are not sufficient. When these applications are insufficient, it is necessary to at least use the dedicated mail box as well as a file system that is usually represented as a folder structure. Organization in the structure is usually based on defect identification (Id). Defect Id can be used as a folder name to store defect-related data and attachments, to separate them from other defects' data and attachments. This simple example illustrates that using just a word processor or spreadsheet is not sufficient, and it becomes necessary to provide mailbox and folder structure maintenance as well as word processor or spreadsheet maintenance.

In cases like this, it is difficult to avoid duplicating the same information as for, example, the status of the mail message and defect status, as well as other comments written inside the word processor, for example, and forgotten to be copied in the mail answer. Maintenance of duplicate information is always error-prone.

Creating reports can be cumbersome, especially in cases when reporting requires the use of historical or archived data. When there are many defects, creating a report can consume a lot of time and is error-prone, because it is based on manual typing and selection.

IV. SDR IMPROVED VERSION

In the improved version, a word processor or spreadsheet is replaced by relations database, and defects are stored inside of the SQL database.

The mailbox is removed and the user registers defects directly in the database. Figure 3 illustrates this high-level architecture of the automated and optimized version:

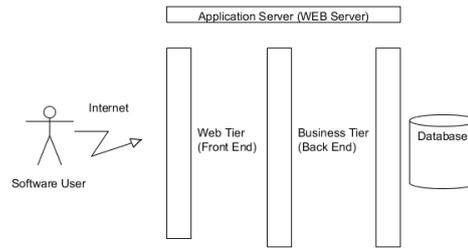


Figure 3 SDR Automated and Optimized Version Architecture Overview

Figure 3 shows the Internet infrastructure to access via Web interface and through a Business Tier communication to database. The Web interface enables easy access to the Defect Registration Database from any location that contains an Internet connection.

The Use Case Context diagram in Figure 4 identifies stakeholders, and their role and interaction with the SDR software:

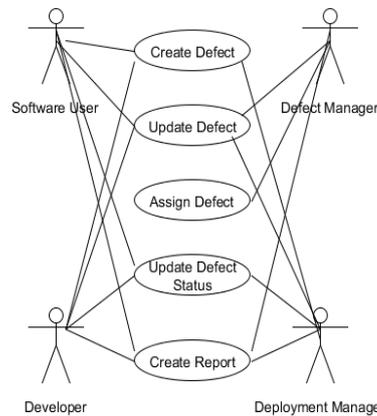


Figure 4 Use Case Context Diagram

Figure 5 illustrates improved workflow. The biggest noticeable change in this workflow is that the mailbox is removed and each stakeholder has direct access to the defect registration database. This means that each stakeholder can at any time check the current defect status as well as be able to create a report.

In this solution, there is an easy-to-implement mail service that warns stakeholders when a particular defect has been updated. To avoid sending a huge number of email messages, they can be limited to a single mail message to the defect owner and a person responsible for defect correction. This is usually a parameter that is configurable per stakeholders' role.

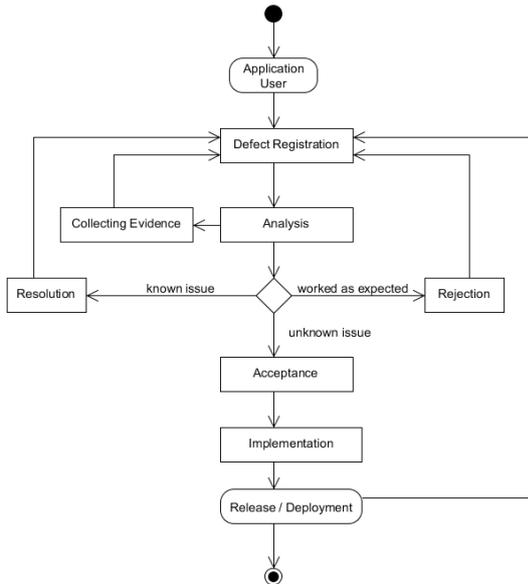


Figure 5 Automated and Optimized Version

Here, all mail messages that were human actions in the initial version replaced by a mail service that sends an automatic mail message if anything regarding the registered defect has been changed. This also means that the defect registration database becomes a collaboration tool. Messages are not just exchanged, but are also stored together with the defect data.

A. State Diagrams

Changing the defect status is probably the most important part of reporting, and these changes are used to follow up on actions that are accomplished in each of the workflow processes. For example, if a defect status is new, this status means that the new defect is received, but also that application support has not taken any other action related to defect analysis and correction.

Defining states and constructing sufficient state transitions that cover particular process workflow needs depends on the analyst’s experience and education, and it is good to know that identified states, as well as state-naming conventions, are subjective. This is not a problem if identified states and state transitions are sufficient for the particular process workflow. However, improving process workflow and internal organization is a continuous process and optimization and improvement can require different states and state transitions, as well as the removal of existing states and state transitions.

In the process workflow described in Figure 1, the following states can be identified:

1. New –New mail about a defect has been received,
2. Accepted – The defect is recognized as a new issue and assigned to a person who is responsible for correction,
3. Implemented – The defect is corrected and ready for testing,
4. Tested – The defect is successfully tested and ready for deployment,

5. Closed – This final state means the defect has been delivered to the User and is a part of the delivered solution,
6. Resolved – This means that it is an old and known issue and has an existing workaround and solution that can be quickly implemented and delivered. This can be done by direct changes in production system, correcting the database by using interactive commands, or by executing script or shell commands, for example,
7. Rejected –Even functionality does not satisfy User’s needs; this is not a Defect, but rather an architecture and design issue and requires a different process workflow, such as a workflow defined for a Change Request (CR). A CR is a requirement for new functionality, or updating or changing an existing process, requiring resources and additional time to be implemented. This paper does not provide workflow related to the CR.

While the above state descriptions are sufficient for understanding each state purpose, the state transition is best described visually. Figure 6 is a state diagram that illustrates the transition of the above defined states:

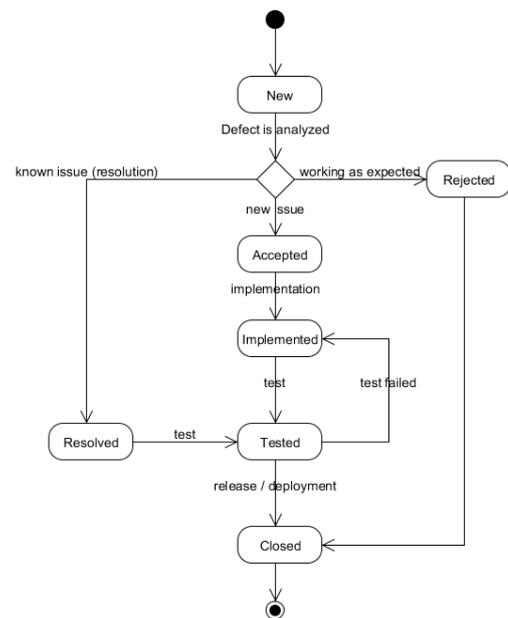


Figure 6 State Transition Automated and Optimized Version

The above diagram shows all legal states as well as allowed state transitions. This diagram can be too complex and usually is divided in more diagrams where each diagram describes the states, state transitions, and affected process workflow. Figure 7 illustrates the workflow process in cases when a defect is already known and there is a workaround that can quickly correct the issue and enable task accomplishment:

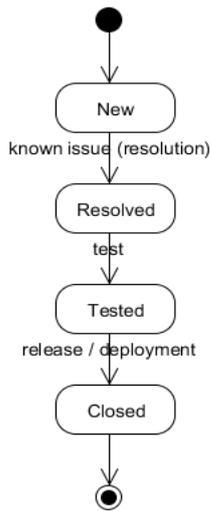


Figure 7 Resolved State Diagram

Figure 8 illustrates status changes in cases where the defect is rejected:

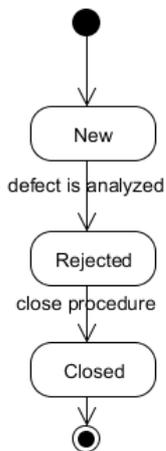


Figure 8 Rejected State Diagram

In the case of a defect rejection, additional procedures can be specified closing the Defect, for example that the user shall approve the process before the defect can be closed. This procedure is usually a part of quality control, and gives the user an opportunity to review the defect and add new details or evidence.

Figure 9 illustrates a state diagram where the defect is recognized as a new issue and accepted:

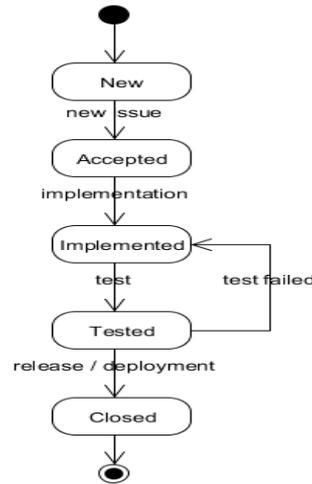


Figure 9 Accepted State Diagram

When a defect is recognized as a new issue and is in accepted status, the test and implementation procedures can be repeated many times should the implementation not satisfy all test requirements.

V. DATA MODEL DESIGN

The presented solution can be implemented by using a simple database model. This is illustrated in Figure 10.

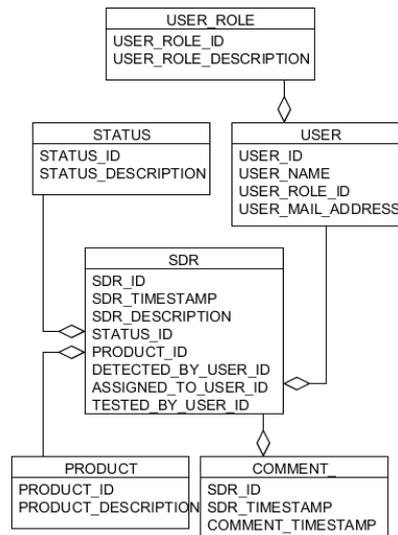


Figure 10 Database Model

In the SDR table all sorts of defect information can be stored, such as defect Id, status, description, severity, priority, root cause, defect contact person, date and time when defect occurs, application version, module and module version where defect occurs, person responsible for defect analysis, correction and test, planned release, attachments and attachments' upload location, and more, as well as the defect history. Defect history in this case means that each change of the defect information is stored in a separate row and can be used for reporting purposes as well as for a defect undo or redo functionality. In the

COMMENT table, any comments from any person are stored in chronological order.

While all of this is available as a part of the standard solution, it is not difficult to imagine how much effort would be required to maintain just a part of this information in a word processor or a spreadsheet solution. Another issue is that manual updates are error-prone, and in cases where an audit log or history of previous changes does not exist, it can be very difficult or even impossible to reconstruct.

For the database solution, it is of course necessary to develop a solution and write a code. On the Windows platform, with the help of .NET languages and Visual Studio Expression Web (free version), this can be accomplished in just a few days. Maintenance is very easy because of the simplicity of the model and changes. Changes will likely be very seldom. Once defined, the SDR table attributes will rarely be altered and never deleted because deletion would delete the historical data too.

With this database solution, all of the data exists in one place and from that place it is possible to update data and communicate and collaborate with all involved persons.

Writing mail messages can be a time-consuming process in addition to collecting evidence and relevant information that needs to be sent to other people. Many times it cannot be accomplished by only one mail message, and multiple messages are sent until the issue is clarified and all necessary information is exchanged.

In the case of this database solution, writing a mail message is not necessary and all available data and information, as well as additional comments, are easily accessible by all authorized persons. Any changes of defect data can trigger an automatic mail notification to all responsible persons if needed, and mark what has been changed, when, and by whom. If it is not sufficient, an individual who received a message can access the database and check the available defect information.

Storing additional defect information, such as pictures, error logs, etc, can be managed by application and a database can contain this information about locations and automatic retrieve the information. One example of this solution is the Hyperlink field type in the Microsoft Access database.

Reports in the database solution can be already predefined, but in this case can also be used as an interactive SQL tool and the SQL query can be saved for future use. The SQL is flexible enough and provides additional reporting features and filtering possibilities.

VI. CONCLUSION

The data model presented in the previous section is an example of the star schema or multi-dimensional schema. This model is very simple to expand upon by adding new dimensional tables around the SDR data table. In this case, STATUS, USER, and PRODUCT are all dimensional tables. Adding a new dimension table, such as a SEVERITY table, simply requires adding a foreign key into the SDR table and, of course, the new table and table attributes.

Each defect needs to be categorized according to a severity level. The severity level does not reflect the amount of work required, but instead reflects how serious the defect appears from the customer's view of point, or how seriously the defect affects the customer's business. This also means that an estimation of the amount of work necessary to correct the defect is a separate process.

Besides a single point of communication, easy access to the SDR database, database data management, and search and reporting capabilities, another huge advantage of this solution is the ability to easily integrate this solution to existing applications. This means that the technical platform for implementing this suggested solution, such as hardware, operating system, programming language, and database are our own choice.

VII. FURTHER WORK

One of the best indications that an application is missing some functionality or the existing functionality is not sufficient is when a defect is rejected. Rejected defects can become future Change Requests (CR). A CR workflow and state transitions are different from the defect and they need to be addressed. Other future work includes the creation of state transition diagrams when an existing closed defect is reopened. The presented database is obviously missing important information. It is intended that future work will extend the data model and add needed information, such as severity and priority of a defect, whether the defect was discovered in release and delivered in release, and the module, or library where a defects are discovered, etc. References [4], [6], and [9] provide more details.

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Use of Information Technology in Hydrological Analysis

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Abstract - Present paper demonstrates the use of information technology in hydrological analyses. A model of the catchment area of River Banjska was made using graph theory and digital terrain model. SQL query was used for searching data in tables, in order to perform hydrologic analysis of digital terrain models of River Banjska basin. The aim of this paper is to demonstrate the practical value of the developed model in future hydrological analyses.

I. INTRODUCTION

Hydroinformatics is a scientific discipline that, in a narrow sense, covers and connects digital terrain models, computational geometry, relational databases, database browsing and graph theory. In a broader sense, hydroinformatics also covers hydrological models that use the physical representation of hydrologic processes.

Graph theory defines computer presentation of graphs, as well as the graph browsing algorithms. The directed graph presented in this paper has been constructed in order to represent River Banjska hydrographic network. This graph will further be used for the analysis of water management in this basin.

For this purpose has been used the digital terrain model of the basin of River Banjska, tributary to River Juzna Morava. Digital Elevation Model (DEM) has a regular structure of a 25 x 25 m square grid. It served as the basis for hydrological processing by ArcHydro software, developed by the Center for Research in Water Resources of the University of Texas. DEM analysis is a preprocessing procedure that involves elimination of all irregularities arising from imperfections of the digital elevation model creation. Processing procedure defines flow direction (Flow Direction method) on all DEM segments and water accumulation (Flow Accumulation method) based on flow direction on each of the grid squares (using Flow Direction method). Results have been used to obtain flow definition (Stream Definition method) and basin delineation at all points of connection of river network, as well as at the basin exit.

Hydraulic junctions (Hydro Junctions object) and river sections (Hydro Edges objects) have been defined in the later stages and they have been recorded in .mdb database tables, attributes of which include geometry data (shape: Point, shape: Line and shape: Polygon). This concept is called the Object Relational Database. Tables of this database are connected through key fields and external fields. Database browsing has been implemented by means of the standard query language – SQL.

II. GRAPH THEORY

A graph $G=(V,E)$ is made of the collection of nodes V and the collection of edges E . Edges represent relations between the nodes and they correspond to pairs of nodes. Graph can be directed, if the branches are organized pairs, or undirected, if the branches are not organized pairs [1]. Graph can be cyclic, or acyclic, representing nodes and links in hydrotechnics.

A simple graph is a graph with no parallel and cyclic junctions, where parallel junctions are the junctions with double connection to two same nodes, while cyclic junctions connect one node within a graph with itself. The edges in a simple graph are unique links, where $E=(i,j)=(j,i)$ applies to all edges.

A complete graph is a simple graph with the maximum number of junctions [1]. The highest possible number of junctions is NC^2 , where NC is the number of sets of nodes. If cyclic junctions (NC) are excluded and the remainder is divided by two (as NC^2 is obtained by taking each junction twice), the total number of links of a complete graph is $NC \cdot (NC-1)/2$.

If graph nodes represent specific objects in space, then they belong to the Euclidean graph. Planar graph is the Euclidian graph whereby the edges represented in a plane have no intersections [5]. If a graph does not include rings (cyclic junctions) and provided that the number of edges in a graph equals the number of nodes minus one, if there is only one edge connecting two nodes and if any of the junctions of the graph is omitted, then the graph is called the Tree (branch network).

One of more significant problems in graph theory is the subject of the Minimum Spanning Tree. The minimum spanning tree is a subgraph that includes all graph nodes with the minimum sum length of edges [6]. Thus, the minimum spanning tree is a Tree, i.e. a graph with a branch network. If there is an undirected weight graph, the minimum spanning tree is the tree, the edges of which have the smallest sum of weights. Sum weight of edges is often called the cost of the tree, due to the application of this concept in industry. It is important to note that such trees need not to be unique to a certain graph, that is, there can be several minimum trees with the same “cost” of tree for the same graph.

The hydrographic network is graph directed in an acyclic way, where the edges are presented as the organized pairs of nodes and where the rule $(i,j) \neq (j,i)$ applies. When each of the edges memorizes an attribute associated with the specific object (for example, the length of the river section), then this graph becomes a weight graph.

Acyclic directed graphs have a linear branched structure. If the direction of edges is known, the nodes can be used in order to arrive from one end of the graph to another. Unlike the acyclic ones, cyclic graphs define circular (cycled) arrangement of nodes and edges.

Topologic sorting of the directed acyclic graph $G=(V, E)$ is a linear organization of all nodes, whereby if the graph G has branch (u, v) , then the node u is located before node v in the resulting series of nodes [6]. If the graph is not acyclic, topologic sorting is not possible. Directed acyclic graph is frequently used to present the

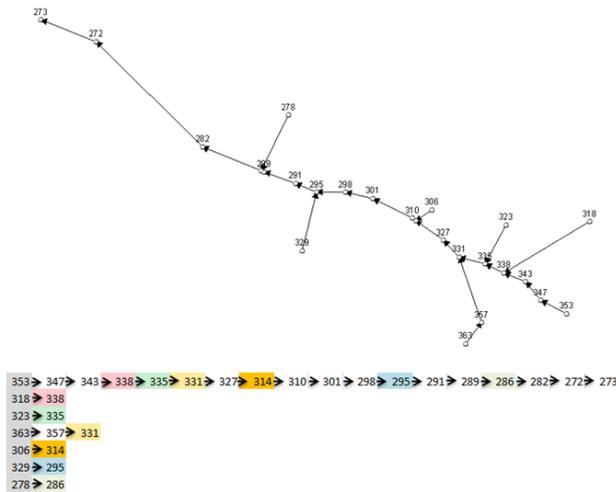


Figure 1. Directed graph of River Banjska up to the "Vranjska Banja" HS with the connectivity list

connections between events. Branch (u, v) means that the event u must end before the execution of the event v starts.

Topologic sorting may be used for identification of the shortest (or the only possible) routes from all nodes to the exit node. This is very important in hydroinformatics, as topologic sorting of hydronodes defines the direction of the graph, i.e. the direction of water movement along the hydrographic network.

A directed graph has been formed between the nodes and edges in River Banjska basin. The set of river network nodes has been defined by the entity *HydroJunction*, while the set of edges has been presented by the entity *HydroEdge*. The entity *HydroEdge* is the link between the river network nodes, and, thus, each edge possesses data on its start and end nodes. By this method were formed two organized sets of nodes and edges. The entity *HydroJunction* is made of nodes representing sources and confluences and the exit node located at the most downstream end of the hydrographic network ("Vranjska Banja" HS). A directed graph has been formed only from the nodes which have the basin that mouths to them – *confluence nodes and exit node*. Figure 1 shows the directed graph of River Banjska up to the "Vranjska Banja" HS.

III. DIGITAL TERRAIN MODEL

Digital Elevation Model (DTM) is used for the representation of terrain's surface. Historically, the DTM model was developed at the Massachusetts Institute of Technology in 1950 [2]. One of the DTM definitions

reads: DTM is a numerical and mathematical terrain representation created by application of respective height and position measurements, density- and distribution-wise compatible with the terrain. Hence, the height of all points on the analyzed terrain can be automatically generated by interpolation, with the corresponding accuracy.

There are several methods of representation of terrain's surface. They are as follows [4]: DHT (Digital Height Model), DGM (Digital Ground Model) and DTED (Digital Terrain Elevation Data).

DTM structure can be regular or irregular. Regular structure represents a grid of rectangles, while the irregular one represents an arbitrary grid of triangles created on the basis of known point coordinates (x, y, z) . Two types of digital models are the most frequent: the Grid structure and the TIN structure.

The size of the grid structure is affected by many morphological parameters, such as slope, river network density and curviness of the watercourse. In addition, the quality of the DEM is affected by geodetic maps that limit grid resolution. To select the optimal resolution DEM for hydrologic analysis, a sensitivity study of river networks for two small basins in the western part of United States [8] was performed. On this occasion, the authors have

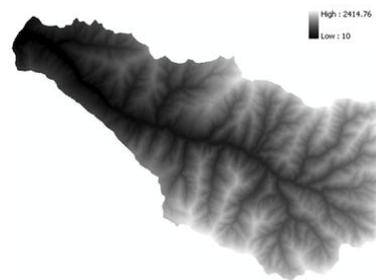


Figure 2. Digital elevation model characterized by a 25 x 25 m square used field size grid structures in the range from 2 m to 90 m and formed the river. It was concluded that the optimum size of the grid structure in the basin was 10 m.

Digital elevation model (DEM) of River Banjska was made using scanned analog topographic map with the 1:25 000 scale (Figure 2). For digitizing of contour lines in order to form a vector model were used geodetic maps. Conversion to raster format, which consists of regular grid structures, was performed. Equidistance contour was equal to $e = 10$ m and, because of this, the accuracy of DEM was $e/3 = 3.33$ m [2]. A digital elevation model with a regular 25 x 25 m grid structure was created. The choice of the size of the fields was affected by the lack of satellite images, which resulted in the use of topographic maps that are less accurate.

Digital elevation model of the River Banjska basin terrain was used for the hydrologic processing of the terrain (Figure 2). Terrain processing has been performed by the ArcHydro software operating in the ArcGIS environment. Preprocessing has been performed using the DEM tools developed by the University of Texas (Austin).

An important step in the DEM processing was the embedding of the previously defined river network. This

procedure helps to avoid the problem of water transition to other basins, as a consequence of inevitable errors made in the creation of the digital terrain model.

DEM processing involves computation of flow direction, water accumulation, definition of river network, segmentation of river course and delineation of the basin area. Segmented river course and known flow directions provide for the identification of the basin area.

A. Preprocessing

An important step in DEM preprocessing was a formation of the previously defined river network, which is embedded into DEM [3]. This procedure involves entering of the river network (.dwg) in the vector form, redrawn from the topographic map, and its conversion into the raster form. This raster is embedded into DEM in such a manner that the lowest points are corrected. After the embedding has been completed, the lowest DEM points should correspond to the entered river network.

This procedure helps to avoid the problem of water transition to another basin, than can occur as a consequence of inevitable errors made in the process of terrain digitalization.

B. Processing

DEM processing includes determination of flow direction for each square of the DEM grid, accumulation of grid of squares, what is conducted by means of predefined flow directions, river network formation, river course segmentation and, as the final task, basin surface delineation.

Water flow direction has a twofold definition. In hydrology, it is a direction with the biggest terrain slope. In hydroinformatics, the terrain is divided by the grid of squares so that each square is surrounded by another eight squares [7]. Height differences between the central square and the other eight squares can then be calculated. Diagonal directions have longer water routes than those that are perpendicular, and, thus, the calculation of the central distances of diagonal squares requires multiplication by $\sqrt{2}$. Central distances used to calculate head and water flow will correspond to the direction of the biggest head of the heads calculated for the eight directions. Figure 3 shows grid distribution of unit width, while the numbers in the grid are an indication of elevation.

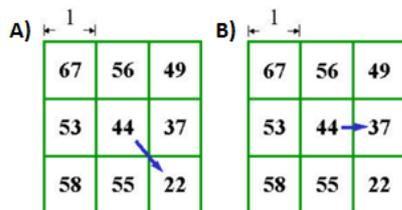


Figure 3. Illustration of flow direction, diagonal (A) and central (B)

Flow direction determination involved the use of the model with eight potential head directions from one square of the grid, four along perpendicular directions and

four along inter-directions [1]. Such a model of head determination is called D8. There is also a simplified model D4 that involves only main directions (north, west, south and east). Direction determination under the digital

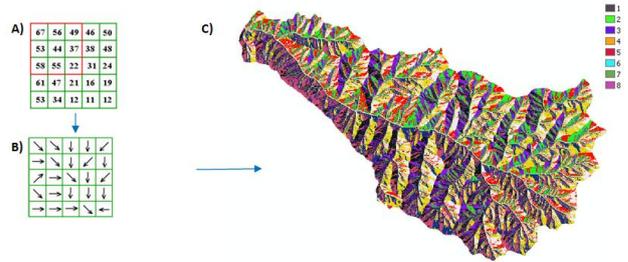


Figure 4. Square height (A), water flow direction (Flow Direction) in a single segment (B) and the entire basin area (C)

model starts from the most upstream to the most downstream grid square. The goal of head direction determination from the square grid in one DEM is the formation of a raster containing data on the total water accumulation in the basin. Each square grid will be assigned a number representing how many upstream squares mouth into the subject square. Data on water accumulation in each of the grid segments are crucial for stream definition and catchment grid delineation.

C. Flow Accumulation

Square heights and flow directions as defined by the maximum head in the D8 model (Figure 5A, B) are presented for a wider area. This method has been used to compute the flow directions for the 25 x 25 m square grid (Flow Direction) of the River Banjska basin up to the "Vranjska Banja" hydrologic station (Figure 5C) [7]. Flow directions have been identified by different colors.

Based on predefined water flow directions one can determine Flow Accumulation for each square in the grid of squares [1]. The value of flow accumulation is equal to zero in the fields without inflow, i.e. in the edge fields. This value is different from zero in all other fields. The number of accumulated squares is determined separately for each grid square. For example, the central field of one DEM part in Figure 5A has 11 accumulated squares and this is a sum of all upstream squares converging to the central one.

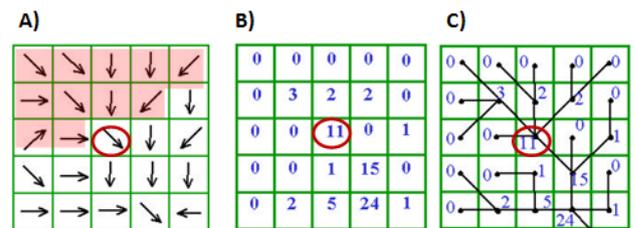


Figure 5. Square By flow direction (A) and flow accumulation (B and C)

The water accumulation problem is resolved by application of acyclic graph theory. The result of this operation is a sum of upstream squares gravitating to the subject square. The query of the graph, i.e. the layer of water flow direction (Flow Direction), according to the mentioned criterion, is shown in Figure 5B. The results



Figure 6. Flow accumulation in the River Banjska basin up to the “Vranjska Banja” HS

arising from data on water accumulation are of fundamental importance for the further analyses.

Figure 6 shows flow accumulation for the entire River Banjska basin. White color corresponds to the points of agglomeration of accumulated squares, while the white groups provide the image of the future hydrographic network.

This figure provides a conclusion that the lighter colors corresponds to the valleys on the terrain. These points are the points of abrupt water accumulation along the slopes and, thus, the number of squares that the water drains from is the highest at the exit from the basin, i.e. at the profile of the “Vranjska Banja” HS (174 942 squares).

D. Formation of river network - Stream Definition

In order to form river network (Stream Definition), it is necessary to determine the number of accumulated squares in the entire basin area.

This requirement is applicable to the entire basin area and it is applied from the most upstream parts of the basin area towards the downstream parts [1]. Actually, stream definition formation may be defined as a query (SQL query) along the raster layer of the accumulated grid squares, the value of which is either higher or equal to the assigned initial requirement of the stream definition formation.

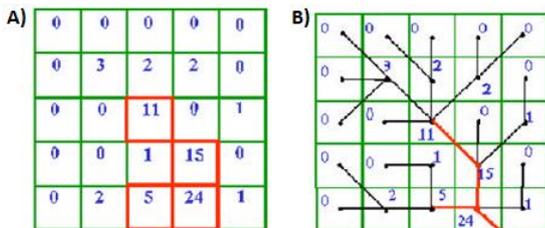


Figure 7. Accumulation of grid squares and stream definition in the subject basin segment

Figure 7A shows the accumulated squares in one segment of the DEM, as a result of the analysis from the previous chapter (3.2.2). If the preset criterion is to form the flow by the accumulation of 5 grid squares, then this criterion for a 25 square grid is met with 4 grid squares

highlighted in red (Figure 7A). Connection of the squares results in the river course shown in red in Figure 7B.

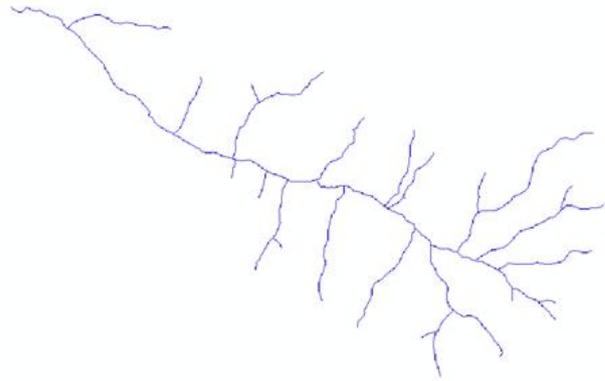


Figure 8. Formation of the river flow (Stream Definition) on River Banjska starting from the “Vranjska Banja” HS

The conclusion is that the resulting grid is obtained in the raster form and that the reduction of the criterion on the number of accumulated squares leads to an increase in the number of the squares in the raster and vice versa.

The criterion for the formation of river network in the River Banjska basin was that the river flow should be formed upon the basis of 1000 accumulated squares on a DEM grid. The formation procedure is iterative and, according to the preset criterion, the grid is drawn on the 1:25 000 scale topographic map. If the raster layer fits well to the hydrographic network on the topographic map, then the criterion for stream definition is considered met. Figure 8 shows the raster representing the river network of River Banjska starting from the “Vranjska Banja” HS.

E. Stream Segmentation and Catchment Grid Delineation

In order to start with the catchment grid delineation, all segments of stream definition should be defined separately, i.e. it is necessary to perform the segmentation of the stream definition raster layer (Stream Segmentation). Segments are formed between the edge

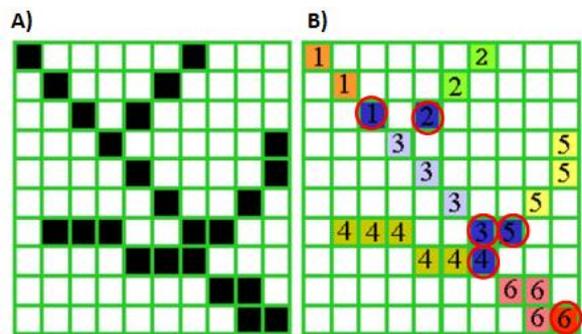


Figure 9. Segmentation of the river network in a single basin segment parts of the grid and the parts whereon the river network branches. This segmentation is shown in Figure 9.

Figure 9 shows six segments of river network. Definition edges, where basin delineation is performed, have been highlighted. The layer with accumulated grid

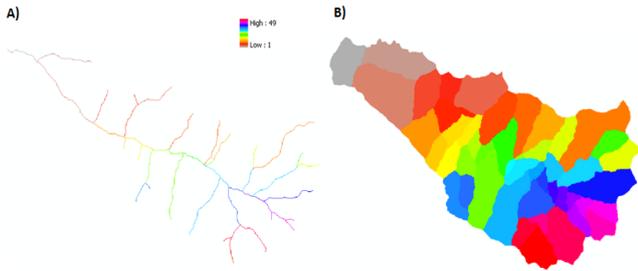


Figure 10. Formation of river sections (Stream links) (A) and Catchment Grid Delineation (B)

squares, with predefined delineation points, was also used. Delineation is performed from the starting points of the river segments along the basin watersheds. Watersheds run along the points where the value of accumulated squares is equal to zero, while the squares of water flow directions correspond to different basins.

Figure 10A shows all river flow segments in different colors - there are total of 49 of them up to the “Vranjska Banja” HS. Flow accumulation and stream segmentation layers have been used for the catchment grid delineation in the raster form. Catchment grids (49 of them in total) have been formed at the points of river flow junctions (Figure 10B).

Hydrologic analyses create a need for basin area merging

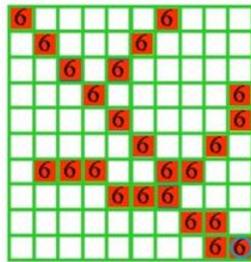


Figure 11. Stream segments merging into one part of the basin because catchment grid delineation is usually performed at the points of hydrologic stations and water management objects. The raster that has defined the stream segmentation will have to be modified. Figure 11 shows grouping of the river network into a single segment, while Figure 9 shows one part of the river course with six segments.

Results of segment merging allow for catchment grid delineation to be performed only in the most downstream part of the segment.

F. Drainage Points and Lines

Delineation means the drawing of the catchments areas at the points of stream junctions and the points of water measurement stations and water management objects. Raster layer shown in Figure 10B is used for the formation of catchment vector form, i.e. for raster vectorization. Catchments in the raster layer are the same as in the vector layer. The vector layer of the catchment contains data on the size and scope of the catchment, as well as the minimum and maximum elevation taken from the DEM.

Flow accumulation and stream links raster layers are used to generate the vector form of drainage line. This is the method used to form vector layer for each river network segment, attributes of which contain the data on the downstream drainage point.

Flow accumulation and catchment grid delineation layers are used to generate catchment drainage points.

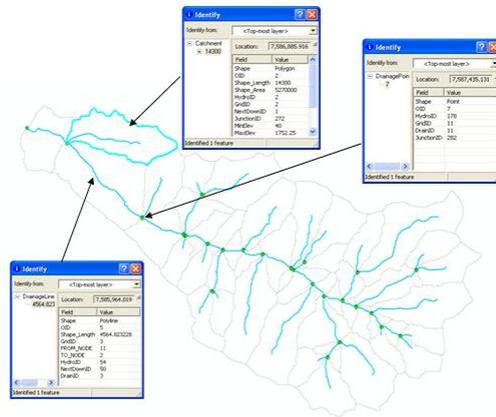


Figure 12. Vector form of the catchment, drainage lines and drainage points of the catchment

This is the method used to form one drainage point for each catchment exit, attributes of which contain data on the associated catchment. Figure 12 shows the vector forms of catchment, drainage points and drainage lines of the catchment.

Catchments, drainage points and drainage lines of the catchment are the spatial databases of complex structure – grids. Drainage points are the connection between the drainage lines and the catchment. Geometric data are recorded in the .mdb database supported by the MS Access software package. Basic geometric data are given in the attributes of the entities such as points, lines and polygons.

Each entity has attributes providing for its unambiguous identification. Such set of attributes is called the primary key. In order to form a link between the entities it is necessary to define external keys. The primary key of an entity is used to define the link to the external key of another entity. Entities may be assigned several primary and external keys. Each entity has attributes providing for its unambiguous identification. Such set of attributes is called the primary key. In order to form a link between the entities it is necessary to define external keys. The primary key of an entity is used to define the link to the external key of another entity. Entities may be assigned several primary and external keys.

Drainage points have the following attributes:

- GridID - primary key used to create a link between Catchment and Drainage Point entities and
- DrainID - external key used to make a link to a Drainage Line entity.

Drainage Line has the following attributes:

- DrainID – primary key and

- Shape_Length – drainage line length (m).

Catchments have the following attributes:

- HydroID - primary key,
- GridID – external key used to make a link to a Drainage Point entity,
- Min_Elev – the minimum elevation in the catchment (m a.s.l.),
- Max_Elev – the maximum elevation in the catchment (m a.s.l.),
- Shape_Length – catchment perimeter (m) and
- Shape_Area – catchment area (m²).

G. Hydronodes and Stream Segments

Hydronodes and stream segments are formed on the basis of Drainage Line, Drainage Point and Catchment entities. The processing of the aforementioned entities results in two new entities - Hydro Edge and Hydro Junction. By means of the external key, tables are connected to the layers they have been formed from.

As opposed to Drainage Point entity, Hydro Junction layer is located at the point of flow origination, at the confluences and catchment exits. In this case, catchment exit is the “Vranjska Banja” hydrologic station. Drainage Point entities occur at the confluences as individual drainage points of each of the catchments, while Hydro Junction represents a unique exit from both catchments located immediately after their confluence.

Hydro Edge represents a polyline connecting two nodes (Hydro Junction) in the stream. This layer is in geometric terms identical to the Drainage Line layer and their difference is reflected in the points they connect and, as such, their attributes differ.

The set of Hydro Edge connections (attributes FROM_JUNC and TO_JUNC) and Hydro Junction points (attributes HydroID) is actually a definition of the directed acyclic graph, $G=(E, V)$. Hydro Junction is a set of nodes organized through HydroID attributes, while Hydro Edge is the set of edges that are actually connected by the Hydro Junction set of nodes. Attributes of the connection

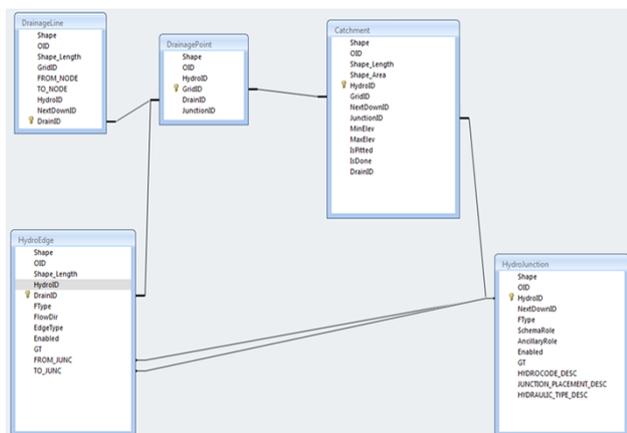


Figure 13. Connections of DrainPoint, DrainLine, Catchment, HydroEdge and HydroJunction entities

with nodes are FROM_JUNC and TO_JUNC.

Figure 13 shows the connections of DrainPoint, DrainLine, Catchment, HydroEdge and HydroJunction entities.

IV. CONCLUSION

Present paper explains the basic forms of digital terrain models, as well as the advantages and disadvantages of each of the forms. Two types of regular structures have been defined, the Grid structure and QuadTree structure. Irregular triangulated grid of the terrain model has been also explained, as well as the methods and rules of its formation. The presented example has used the 25 m x 25 m regular quadratic structure of grid distribution of the River Banjaska basin.

Hydrologic processing has been performed by means of the ArcHydro software operating in the ArcGIS environment. Preprocessing of DEM has been also performed and all irregularities created in digital terrain model formation have been eliminated. This has been the method to perform hydrographic network embedding in the DEM. In subsequent stages, flow directions and flow accumulations have been defined in DEM and the river network has been defined and stream segmentation has been performed. Based on stream segmentation, catchment delineation at the end of segments has been executed.

River network nodes and sections have been created and the key fields have been used to connect them to associated catchment. Catchment drainage points and drainage lines have been also formed. All are located in a relational .mdb database that provides for SQL queries.

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Text Detection and Extraction from TV Screen

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Abstract - In this paper, a system for text extraction on images taken by grabbing the content from the TV screen is presented. The main tendency is the image preparation for the Optical Character Recognition (OCR) to improve its accuracy. Recognized text is used for automatic generation of TV menu system structure. This menu structure is used for verification of TV set operation. In the process of TV verification the selected menu options from resulting file containing the recognized text are compared with those expected TV operation. This system is used as a part of Black Box Testing system in order to test and functionally verify TV set operation. The presented approach consists of several steps in image pre-processing, including character detection and segmentation. In the final step, an open-source algorithm for OCR is then run for text recognition. Finally, the improvement is tested on the range of the full image dimensions and the results are compared with those for the original image. The OCR engines are widely used in various fields of scientific research and have many uses in modern technology. The proposed method is robust for different text fonts and styles, and the results show a satisfying improvement in character recognition accuracy.

I. INTRODUCTION

OCR is mostly used in developing algorithms for reading text on the image taken by the camera, e.g. in reading registration plates, reading scanned books and documents, etc. It is based on algorithms for machine vision and artificial intelligence, i.e. neural networks, support vector machines, fuzzy classifiers, etc. There are many different approaches in image preparation for OCR, like the implementation of a special mask that is applied for detection of character-like edges, with the conclusion that connected component based algorithm is less robust than the edge based algorithm [1]. In another approach, histogram projections in both image directions are determined, in order to detect text line positions [2].

The approach proposed in this paper is tested on still images and presents another use of the OCR, that is for text recognition of TV screen contents. The OCR used here is an open-source engine. The proposed system is used as a part of Black Box Testing (BBT) system [3]–[4] in order to test and verify the TV set functionality.

Namely, it grabs the image representing the current TV screen content, prepares it for OCR, and runs OCR to detect regions of text on the image and read its content.

Text extraction is used to verify the functional operation of TV sets by, for example, reading the menu options presented on the screen in order to verify if the TV opened the correct menu when presented with a given set of remote control commands.

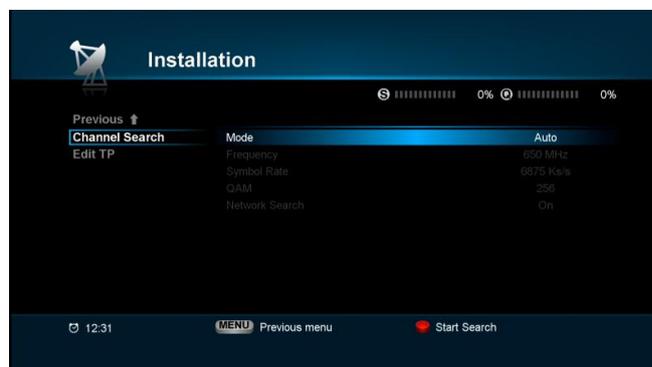


Fig. 1. Grabbed image

This paper is organized as follows: section 2 presents the algorithm on which the system is based on, while in section 3 it is explained how the grabbed image (Fig. 1.) is prepared for OCR. Section 4 gives the final experimental and comparison results of the proposed method after testing the applied extraction and recognition algorithm from OCR on the grabbed images. Finally, section 5 gives some conclusions and plans for future work.

II. SYSTEM AND ALGORITHM OVERVIEW

The proposed system for text extraction using OCR, as a part of a system for testing and functional verification of digital television sets (Fig. 2.), consists of:

- Object under test (TV set)
- Grabbing device
- Algorithm that analyzes the grabbed image, which consists of:
 - Preparation for OCR
 - OCR
- Final decision making process which:
 - Compares the extracted text with the expected content
 - Decides whether the test passes or fails.

These are the steps in the text extraction algorithm:

- Edge detection
- Detection of candidate lines for text region boundaries and their labeling
- Adaptive thresholding
- OCR run on the entire image.

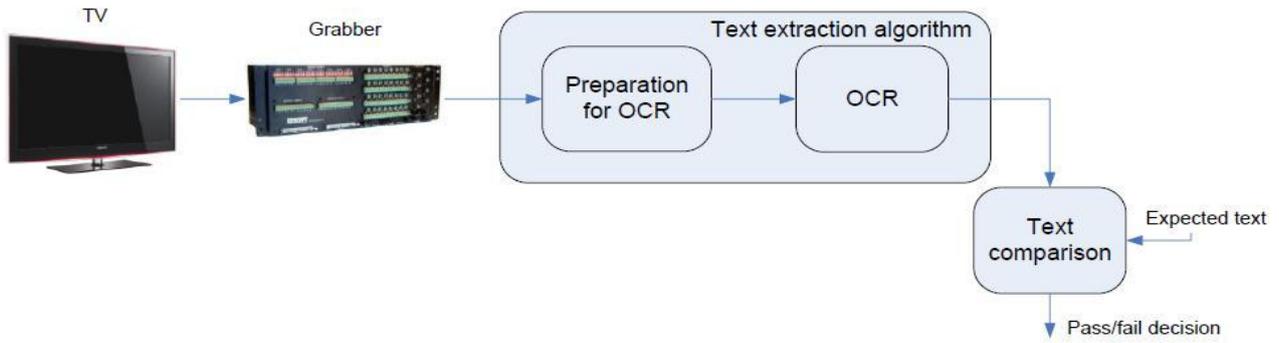


Fig. 2. The system overview

The algorithm of the proposed method is presented in Fig. 3.

III. IMAGE PREPARATION FOR OCR

It is necessary to achieve better contrast between image objects (possibly text candidates) and background, in order to get better results in text recognition. Therefore, the following steps are performed during image preparation for process of character recognition.

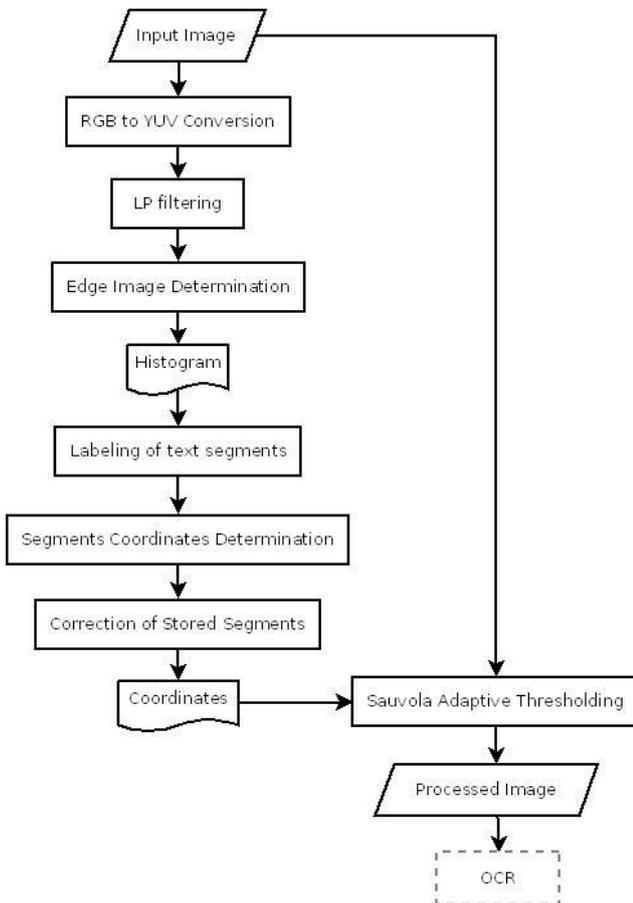


Fig. 3. Algorithm of pre-processing the grabbed image

A. Edge Detection

This is the first important step in image preparation for further pre-processing, but in the beginning, a Gaussian noise reduction is done on the grabbed image, previously converted to gray-scale. After de-noising, the algorithm for edge detection is implemented [5], considering only those pixels that have high contrast to their neighboring pixels. All the pixel values from the original image are replaced with the maximum difference between the pixel and its neighbors, calculated by their absolute value, following the constraints:

$$X_{i,j-1} > X_{i-1,j} \wedge X_{i,j-1} > X_{i-1,j+1} \Rightarrow X_{\max} = X_{i,j-1}$$

$$X_{i,j-1} < X_{i-1,j} \wedge X_{i,j-1} < X_{i-1,j+1} \Rightarrow X_{\max} = X_{i-1,j}$$

where X_{ij} is the current pixel value, and its neighbors are shown in Fig. 4. All character pixels, as well as some non-character pixels which also show high local color contrast, are registered in the edge image. This procedure is highly effective. The binarization threshold used here is static and is empirically determined from the luminance histogram. The edges of the grabbed illustrative image are shown in Fig. 5.

B. Localization and Segmentation of Text Regions

The text regions localization process is composed of several steps, and the most important ones are text line extraction and text region coordinates determination. In this way, all the text regions are found and their coordinates are stored for future use. The idea was to precisely determine only segments containing text, so they could represent sub-images. This could improve OCR performance. However, due to the operation functionality of the system, the OCR is run on the whole image.

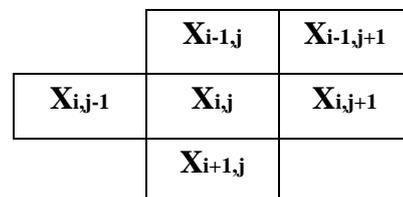


Fig. 4. Neighboring pixels



Fig. 5. Edge image



Fig. 6. Labeled text regions

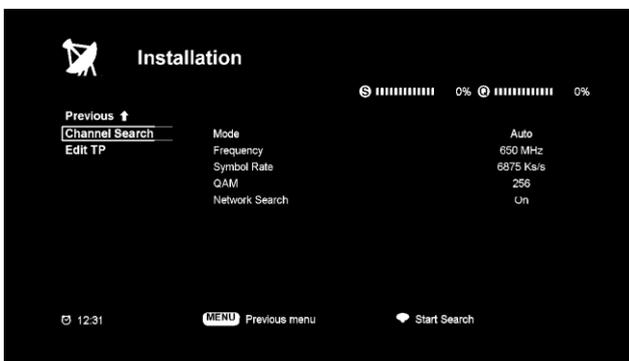


Fig. 7. Binarized grabbed image using Sauvola method

C. Labeling of Text Segments

All the image segments where text candidates are found are now labeled, after applying a few constraints for non-text elimination, to visually make image preparation easier and serves as a kind of verification.

The labeling process is perfected in order to get regions containing only text. It is done by adding more lines in the neighborhood of the detected text areas. These lines are added only if the current line in the observed segment is surrounded with text pixels positioned on the following sides: lower right, lower left, upper right and upper left. The outcome of this step of the algorithm is shown in Fig. 6.

D. Adaptive Thresholding

Having the positions of text regions prepared, the final step in image preparation for recognition is adaptive, or local thresholding, and to achieve this, Sauvola method

[6] is used.

In order to determine the threshold $t(x,y)$ for the pixel (x,y) , the window of the area $w \times w$ around the pixel is considered and its mean value and standard deviation are calculated as $m(x,y)$ and $s(x,y)$, respectively. Let R be the maximum value of the standard deviation and k be a parameter, the threshold is computed using (1).

$$t(x,y) = m(x,y) \cdot \left[1 + k \cdot \left(\frac{s(x,y)}{R} - 1 \right) \right] \quad (1)$$

In the proposed algorithm, the value for the maximum standard deviation used here is $R = 128$ (as suggested by Sauvola for gray-scale images) and the value of the parameter k is in the range from 0.2 to 0.5.

If it is considered that, in a gray-scale image in which $g(x,y) \in [0, 255]$ is the intensity of a pixel at location (x,y) , new binarized pixel values $o(x,y)$ are computed considering (2).

$$o(x,y) = \begin{cases} 0, & \text{if } g(x,y) \leq t(x,y) \\ 255, & \text{other} \end{cases} \quad (2)$$

Using the standard deviation $s(x,y)$ and the mean value $m(x,y)$, the value of the threshold $t(x,y)$ is adapted and is based on the contrast of the neighboring pixels around the processed pixel. When the contrast in some parts of the image is larger, the standard deviation is nearly equal to its maximum value, which results in the threshold being nearly equal to its mean value. Parameter k controls the value of the local window size, so with the larger value of this parameter, the threshold of the locally mean value is lowered. The final image prepared for the OCR is given in Fig. 7.

E. OCR

Finally, the prepared image is fed to an open-source OCR engine, Tesseract [7], which processes the image and reads the text on it. The text is then compared to the expected text, e.g. expected menu content. If the extracted text matches the expected one, the test passes, on the contrary it fails. This allows automatic testing of the functionality of TV sets and their response to remote control commands, e.g. whether they open the correct menu selections or not.

IV. EXPERIMENTAL RESULTS

The testing is done by writing test scripts. Using the control application called the Executor [8], test results are produced in the form of log files. Difference log files represent the resulting accuracy gained by using two metrics: Longest Common Subsequence (LCS) and Levenshtein's difference, as well as the percentage of the accuracy. In another log file the complete text read by OCR is stored. All the attention is paid on the content of these resulting files, as well as the files to which they are compared to-the referent files, i.e. expected text.

TABLE 1: CHARACTER RECOGNITION RESULTS.

Image name	Original image		Processed image	
	Levenshtein's distance	Character match [%]	Levenshtein's distance	Character match [%]
DUT_0_6	77	55	28	91
DUT_0_25	47	81	37	93
DUT_0_26	77	80	65	86
DUT_0_36	86	72	66	80
DUT_0_60	73	72	53	90

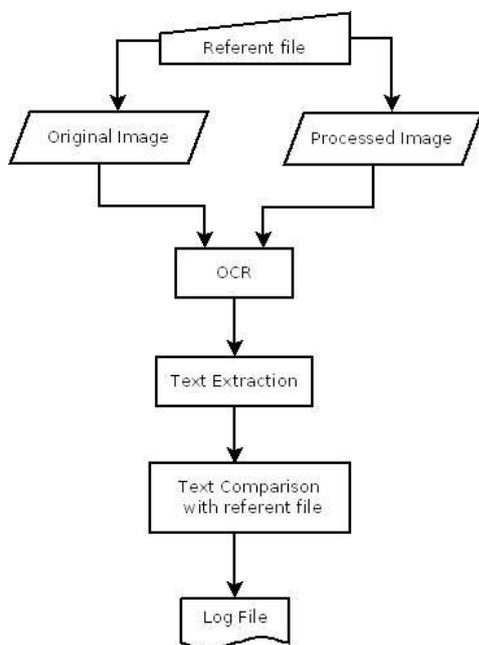


Fig. 8. Comparison Results for Testing

Improvement of the Tesseract engine recognition accuracy is presented on in Table 1 with the results gained by testing system on a few images grabbed from the TV screen. The results for the image that is used as an illustrative example throughout the paper are presented in the last row of the table, while the other images used for testing are similar, but present different menu options and selections.

F. Comparison Results

It is possible to write multiple tests in one test plan with the used application, and the principle of this testing is the comparison of the written referent file (the expected text) and the resulting text from the log file where the recognized text is stored. This process is shown in Fig. 8.

V. CONCLUSION

In this paper, a system for text localization, segmentation and extraction is presented, so characters could be recognized by the open-source OCR. Prior to this, the image is prepared by pre-processing for further system recognition and verification. Preparation steps for OCR include edge image determination, text regions

localization and their labeling, and finally the adaptive thresholding using Sauvola method. The final image, after the implemented algorithm, is given as input to OCR. The results, after the comparison of OCR performance on original and processed image, show improvement in recognition accuracy of 16% for the processed image. It should be stated that the results could be improved even more by adjusting various parameters in the presented algorithm, and that they vary for each image.

The system is used for functional verification of TV sets. Text on the grabbed image is read in order to verify whether the TV responds to remote control commands successfully or not, i.e. whether it opens the correct menu or not. Comparison of different kind of methods is presented in the referenced work [9], while some of the other algorithms are briefly described in [10].

The idea for edge detection using horizontal and vertical projection profiles [5], was abandoned due to the principle it works on and its complexity, so instead, the presented algorithm was suggested. In the future research, algorithm will be further improved to detect only text regions and reduce detection of small non-text regions like some regions around the icons and logos that can be seen on Fig. 7.

ACKNOWLEDGMENT

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Distance Learning Implementation at Preschool Teacher Training College

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Abstract - Higher education plays an important role in our society, but overall potential of vocational colleges has not been fully realized. Serbian colleges often lack the management tools and funding to match their goals, but they are constantly working on modernization and harmonization of their curricula, as well as on improvement of cooperation with labor market and strengthening their links with local communities. Over the past decade vocational colleges have sought opportunities to enroll new students and provide their service to wider student population. The authors of this paper discuss how implementation of Distance Learning at preschool teacher training colleges would positively broaden and deepen these efforts. Distance Learning has become one of the means of more effective teaching worldwide and innovative use of technologies has created more effective techniques to distribute learning in non-traditional ways. Implementing distance learning programs requires new technical and pedagogical skills, but its implementation would make vocational colleges responsive to new educational demands.

I. INTRODUCTION

Higher education plays an essential role in society, creating new knowledge, transferring it to students and fostering innovation. European Union-level actions help higher education institutions throughout Serbia in their efforts to modernize, both in terms of the courses they offer and the way they operate. Significant improvement has been undoubtedly noticed at the latest Ministerial conference in Louven in April 2009, (the third one at which Serbia has submitted its Bologna progress reports; for the first time the report was submitted in Bergen in May 2005), but, overall potential is not being fully realized. Curricula are not always up to date, not enough young people go to university, and not enough adults have ever attended university. Serbian colleges often lack the management tools and funding to match their ambitions. Therefore, further effort is needed so that Higher education in Serbia would achieve higher efficiency of study programmes as well as more thorough work on defining learning outcomes and distribution of credits for the study programmes, development of quality assurance systems and accreditation process.

In the light of these challenges, government and higher education institutions are looking for ways to create better conditions for colleges in Serbia. National governments are responsible for their education and training system, but

individual institutions organize their own curricula. However, the challenges facing higher education are similar across the European Union and there are clear advantages in working together. In addition, a stronger link of higher education and society will need to be considered. As recognized by Schmidt (2005) and Dumas-Hines et al (2001) [1] [2] [3] many institutions of higher learning are facing the challenges of finding ways to diversify their campuses. Colleges in Serbia have to answer the challenge by creating philosophical statements that reflect a national consensus, examining best practices, and implementing activities and action plans.

In order to improve preschool teachers' education and training and make it responsive to new demands of this type of educational provision at preschool institutions in Serbia and Europe-wide, Preschool Teacher Training College in Sremska Mitrovica has participated in Tempus project suggestion for Distance Learning implementation. General idea of the project is to harmonize and modernize curricula for preschool teachers so that they would gain functional knowledge and competencies as well as to improve cooperation between Preschool Teacher Training Colleges and labor market and strengthen their links with local communities. The authors of this paper discuss how implementation of Distance Learning at Preschool Teacher Training Colleges would positively broaden and deepen these efforts.

II. WHAT DOES DISTANCE LEARNING IMPLY

Distance education or distance learning is a field of education that focuses on teaching methods and technology with the aim of delivering teaching to students who are not physically present in a traditional educational setting such as a classroom. It has been described as "a process to create and provide access to learning when the source of information and the learners are separated by time and distance, or both." [4] Distance education courses that require a physical on-site presence for any reason (including taking examinations) have been referred to as hybrid or blended courses of study [5] [6].

Nowadays Distance Learning has become a pervasive and growing phenomenon. Innovative use of technologies has created more effective techniques to distribute learning in non-traditional ways. As a result, new organizational structures and learning arrangements are appearing throughout higher education. Academic

institutions are pooling course offerings through distance learning so students have opportunities to create a degree program that uses course offerings from multiple schools. General idea is that students from participating colleges within the framework of the project choose elective courses from other colleges than their own. Since remote access to learning materials, databases and libraries, electronic communication, computer-connected workgroups and archived lectures has been already familiar to most of students, the implementation of Distance Learning process should be easier. Bearing in mind that Distance Learning places additional responsibilities on students, participating colleges are willing to communicate student responsibilities and the nature of the commitment students must make to succeed in a distance learning program.

III. IMPLEMENTATION OF DISTANCE LEARNING AT PRESCHOOL TEACHER TRAINING COLLEGE

Developing and setup of special parts of Distance Learning system for informal learning in formal environment involves numerous issues, such as: defining of criteria for optimal number of students and continual monitoring of students included in Distance Learning system, recognition and definition of project milestones and crucial elements, defining of features of educative materials for Distance Learning, Distance Learning system programming, purchasing of equipment, software and professional literature, scanning of Information Technology infrastructure and possibilities of this kind of learning in order to reform study programme at the colleges of preschool teacher education in Serbia and harmonize their structure and contents with the examples of the European Union countries. Some of the initial problems include: shortage of professional literature in domestic language, inadequate equipment at the market, problems with internet connection, insufficient number of technical staff for new equipment training, insufficient Information Technology infrastructure, as well as lack of time for infrastructure of Distance Learning preparation, but they have been successfully overcome.

After the possibilities for inclusion of Distance Learning provision of elective courses had been explored, core modules for elective courses were developed (Motor Activities of Preschool Children and Multimedia Activities in English Language Teaching) and modernized text books and manuals were prepared. General idea is to pilot Distance Learning provision for selected elective courses, as well as to introduce innovative elements in teaching methodology.

Since distance learning could occur in many configurations, synchronous (instructions delivered and received simultaneously), or it may be asynchronous (instruction delivered and received at different times), synchronous Distance Learning was chosen, since the students would receive simultaneous broadcast of a lecture being delivered from a central campus location. After the educational objectives of elective courses have been harmonized with distinctive aspects of the student population to be served, the following steps toward organizational commitment are supposed to be taken.

Distance Learning requires significant financial resources for technology and support. Therefore, faculty members and administrators require assistance to manage logistics of distance learning and support systems have to be developed for the distance learning delivery system. An integrated team of computer service technicians, counselors, site administrators, distribution clerks and information resource (library) personnel supports distance learning project.

In order to achieve this goal, certain inputs must be obtained, such as high speed Internet connectivity, codec, web camera, lap-top, projector, microphone arrays, headsets and loudspeakers in order to enable two or more locations to communicate by simultaneous two-way video and audio transmissions. Since its beginnings in the 1990s this technology has rapidly evolved, so that the market offer is quite diverse, as well as the prices. The core technology is digital compression of audio and video streams in real time. The software that performs compression is called a codec (coder/decoder). The other components include:

- Video input: webcam
- Video output : projector
- Audio input: microphones
- Audio output: loudspeakers
- Computer: a data processing unit that ties together the other components, does the compressing and decompressing, and initiates and maintains the data linkage via the network.

The components within a Conferencing System can be divided up into several different layers: User Interface, Conference Control, Control or Signal Plane and Media Plane. Video Conferencing User Interfaces could either be graphical or voice responsive. User interfaces for conferencing have a number of different uses; it could be used for scheduling, setup, and making the call. Through the User Interface the administrator is able to control the other three layers of the system. Conference Control performs resource allocation, management and routing. This layer along with the User Interface creates meetings (scheduled or unscheduled) or adds and removes participants from a conference. Control (Signaling) Plane contains the stacks that signal different endpoints to create a call and a conference. The Media Plane controls the audio and video mixing and streaming. This layer manages Real-Time Transport Protocols, User Datagram Packets (UDP) and Real-Time Transport Control Protocols (RTCP). The Real-Time Transport Protocol and User Datagram Packet normally carry information such the payload type which is the type of codec, frame rate, video size and many others. Real-Time Transport Control Protocol on the other hand acts as a quality control Protocol for detecting errors during streaming.

Even though substantial resource requirements and expenditures are huge, program quality, unique program attributes and program access were primary reasons for enrollment in this project, not a search for financial windfall. It has also been taken into account that students would have to assume greater responsibility for their

learning, take more initiative in asking questions and obtaining help, be flexible and be prepared to deal with technical difficulties. To foster student achievement, institution has the responsibility to identify students' needs and problems associated with the distance learning environment. The school should adopt a proactive stance for monitoring student progress to address barriers and difficulties students encounter. Since Distance Learning requires students to work independently and to use distributed learning technology to fulfill course requirements, school has to provide proper student training and support. Distance Learning programs and courses, regardless of the mode of instructional delivery, should enable students to attain appropriate educational outcomes.

Students should be in advance familiar with:

- curriculum, course, degree and admission requirements
- availability of academic support service such as counseling, advising, tutoring and placement
- technical competencies and equipment requirements
- performance expectations concerning deadlines, study time requirements and attendance

Implementing distance learning programs requires new technical and pedagogical skills. Institution responsible for Distance Learning implementation should understand and embrace the change from a teaching-centered to a learning-centered environment, with learners, rather than students, and with facilitators and designers of learning experiences, rather than teachers. The former concentrates on achievement of learning goals and seeks the most effective means to accomplish them. The latter focuses on the organization and delivery of information.

Therefore, teachers included in Distance Learning project implementation have to ensure:

- effective creation and delivery of instruction
- evaluation of instructional effectiveness and student achievement
- the development of appropriate assessment strategies
- continued improvement of instructional programs
- innovation in instructional processes
- accessibility to students consistent with the school's expectations and student demands

The choice of strategy was not governed by the availability of technological solutions, but by the needs of the program, learning and communication approaches chosen and desired learning outcomes.

The choice of assessment methodology should support intended learning outcomes, but it also should be consistent with desired learning approaches. Assessment policy should set out the need for formative assessment of students (e.g., projects and assignments and encouraging students to learn through application), but it also should apply summative assessment through formal examination or testing, to measure the attainment of knowledge and skills at specific points in the program.

IV. CONCLUSION

In sum, quality distance learning requires careful attention to learning design, effective training, organizational commitment to adequate program support, selection of appropriate delivery technology, and a focus on student learning outcomes. To accomplish desired outcomes this focus brings with it a change in the roles of students and college, as well as needed support services. Over the past decade vocational colleges have sought opportunities to enroll new students and provide their service to wider student population. Distance Learning has become one of the means of more effective teaching and educational services consistent with the school's stated mission.

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Design, Implementation, and Evaluation of a Web-Based System for Alumni Data Collection

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Abstract - Most standards for quality assurance in higher education area demand establishing and maintaining connections between higher education institutions and their stakeholders. For assessing quality of academic programmes and introducing changes and innovations into curricula connections to alumni are of special interest. Alumni employment rates and job position listings are useful indicators of quality of the institution and could be used for different purposes, like attracting prospective students and business partners. This paper presents the design and implementation of a web-based system that is used as an efficient tool for communication between higher education institution and its graduated students, and for collecting and analysis of alumni related data that could be used for different purposes, including improvement of academic programmes. The system was designed and implemented at the Faculty of Electrical Engineering East Sarajevo. Evaluation of the system performance showed good results in terms of data collected and attitudes of alumni with regard to introduction and use of the system.

I. INTRODUCTION

Maintaining connections to all relevant stakeholders is a requirement usually introduced by standards for quality assurance (QA) in higher education. European standards for internal QA in higher education demand significant role of students, graduated students, employers, labour market and other relevant stakeholders in the QA process [1]. Establishing and maintaining connections to these stakeholders enables getting valuable feedback that could be used for many purposes. One of the main uses of alumni and employer feedback is for analysis of quality of academic programmes and adapting curricula to new demands of labour market [2,3]. This is especially significant in engineering education, where things are continually changing and new technologies are frequently introduced [4]. Graduate employment ratio and feedback from employers that are hiring new graduates could be useful indicators of an academic programme quality [5,6]. Beside the quality assurance dimension, establishing and maintaining connections to alumni provides many other benefits to higher education institutions (HEIs), to their students, as well as to alumni. Alumni stakeholder group is considered as one of the most significant resources that HEIs have nationally and internationally because of the potential value they can add to HEIs [7]. The added value is not just a financial nature, but also includes enhanced social interaction, networking and knowledge sharing, promotion of an institution and participation in its strategic development.

A significant body of research deals with various aspects of using alumni feedback in higher education [2-10]. However, a limited amount of research is concerned with information technology supported means for alumni data collection [2,7,8]. In [11], graduate tracking systems (GTSs) were analyzed in 10 countries around the world in terms of their owners, objectives, and used methodology. Most GTSs at national level are used to provide information to policy makers, while almost all of them are also used for providing information to universities for use in analysis and improvement of academic programmes. Most GTSs use paper-based or electronic surveys for surveying all students who have graduated in specific year. The methods of collecting alumni related data are mostly based on alumni surveys that are conducted within several years after graduation. Contact information from alumni databases or university career services are usually used for sending surveys to potential participants. In case when the information are out-of-date, or where alumni databases and career services do not exist, various methods are used for collecting alumni contact information, ranging from manual search for names on search engines [9], to harvesting LinkedIn alumni profiles [10]. Most of the related works were concerned on how the data collected from alumni could be used for improvement of academic programmes and institutions. Some of them were concerned with how the data could be collected. Many problems exist in alumni data collection process, mostly related to availability and accuracy of contact information of potential survey participants, as well as to efficiency and effectiveness of the process. This paper presents a web-based system that could be used to address some of the mentioned problems.

The Internet and Web facilitated communication giving the institutions possibility to easily reach their audience, disseminate relevant information and to retrieve feedback. Having this in mind, a web-based graduate tracking system was developed at the Faculty of Electrical Engineering East Sarajevo (FEE) in order to try solving the problem of missing connections between the institution and its stakeholders [3]. Main goals of the system were to create a human and professional network and to encourage all the stakeholders, at first the alumni group, to register their contact and employment information. The system was also intended to provide efficient means of communication between the alumni, and between the alumni and the institution. After the initial design of the system, that was presented earlier in [3], the system was improved with additional features

providing advanced communication and alumni tracking features, as well as interoperability with other systems. This paper presents the design, implementation, and performance evaluation of the system. Although the proposed system has many features common to similar alumni tracking systems (e.g. alumni directory, alumni search), it offers some distinctive features such as significantly different approach in collection of alumni contact and employment data, integration with today's popular social networking sites, extraction of various reports that could be used for direct support to QA at HEIs, and interoperability with proprietary university information systems.

II. SYSTEM DESIGN AND IMPLEMENTATION

Main functions of the system are collection of alumni contact data, collection and analysis of employment data (e.g. employment ratio, average time of waiting for the first employment), collection and analysis of feedback from alumni using built-in survey module, and providing efficient means of communication between alumni and HEIs. Users of the system are alumni, university quality assurance and management staff, as well as other unregistered users in role of web site visitors. Most of the data is entered into the system by registered alumni users within their profiles. Personal data contained in alumni records is confidential and secured by appropriate security mechanisms. Unregistered users have limited access to data. Registered users are able to access more information, depending on their role and privacy settings in the alumni profiles. Architecture of the system is presented in Fig. 1.

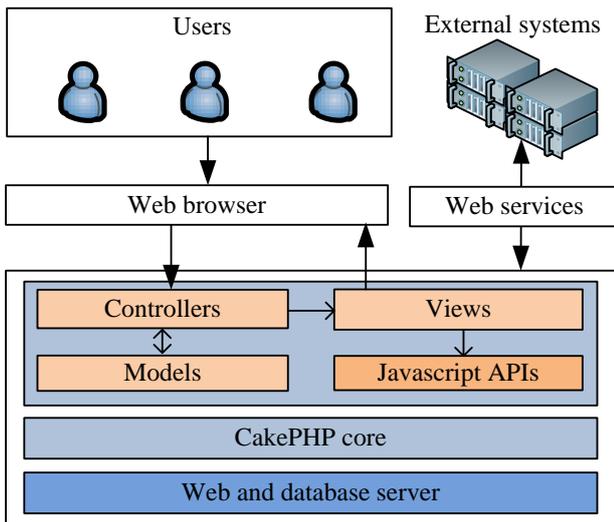


Figure 1. System architecture

A. Main functionalities of the system

Main functionalities of the system are separated into several groups: collecting alumni contact and employment data, reporting based on the collected data, collecting additional feedback from alumni using built-in survey module, and collaboration with other systems.

Alumni contact and employment data are stored within alumni profile. Alumni profile contains personal information, contact information, educational and

employment information of each graduate. Alumni profiles could be generated in two ways. One way is to use existing data from the university information system and to automatically populate alumni profiles with personal and educational information. The other way is to create alumni profile manually during the alumni registration process. After initial creation of alumni profile, alumni are regularly reminded to update their contact and employment information.

Based on the collected personal and employment data, the system provides a number of listings and reports. Some of them are available to public, like alumni and job directories in textual and graphical form (Google Maps), while others are available only to registered users (e.g. employment statistics). An illustration of employment statistics screen is shown in Fig. 2.

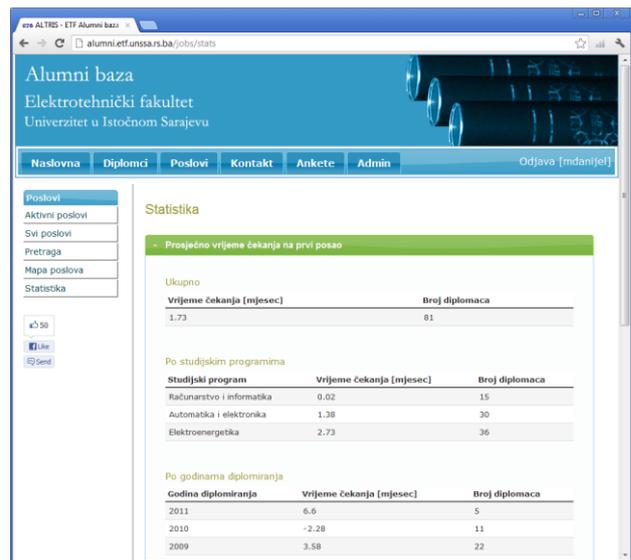


Figure 2. Employment statistics showing average time of waiting for the first employment after graduation

B. Survey module

In order to automate collection of additional feedback from alumni, a special survey module was designed. This module enables users to easily create custom survey, distribute invitation to participants, collect, present and optionally export results of the survey for later use or analysis in other software (e.g. Excel or SPSS). A number of options is available for creating surveys, such as defining questions of different types, defining custom answering scales, setting date and time limits, security options, etc. A screenshot of the online survey form created by the survey module is shown in Fig. 3. Survey results are available in textual and simple graphical form (Fig. 4).

C. Collaboration with other systems

Collaboration with other systems is mostly performed by REST (Representational State Transfer) web services. The system is capable to import data from other systems, as well to export data for use in other systems. For importing alumni data from existing university information systems, the system acts as a web service consumer. The web service is expected to return JSON

formatted result. For export of data, the system exposes a set of web services. The web services were easily created using CakePHP rapid application development framework features that enable returning various representations of resources (e.g. JSON, XML).

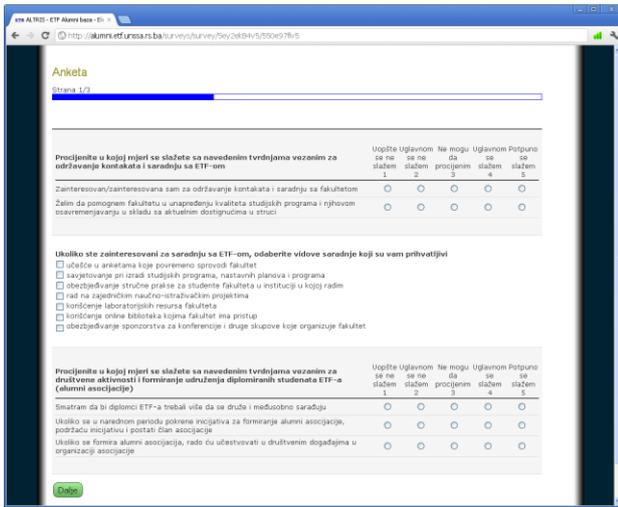


Figure 3. Online survey form

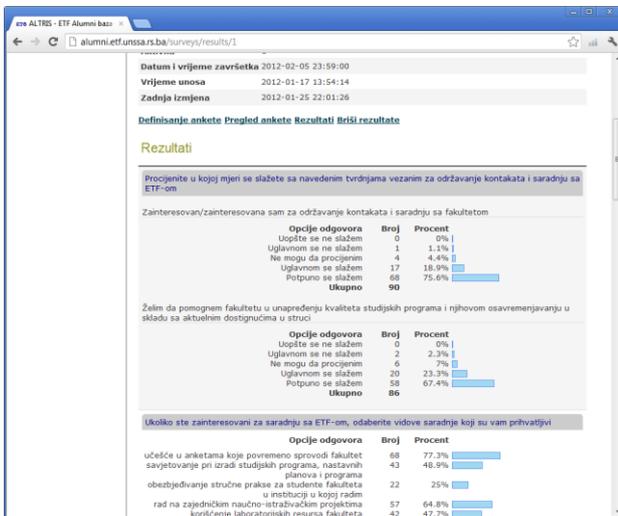


Figure 4. Survey results in textual and graphical form

A widespread of social networking tools is evident in last decade, no matter if they were used at workplace, at home or at university [12,13]. HEIs widely use social networks to interact with students, teaching staff and community [13]. For this reason, the proposed system is also integrated with some popular social networking sites and email providers. For registered users it is possible to use an existing Facebook, Google or Windows Live account to log into the system. Integration with the mentioned systems was done using appropriate APIs available for these systems and following the OAuth 2.0 authentication and authorization protocol. Beside remote authentication, the system provides automated distribution of selected information (posts, news, events) to Facebook users who have 'liked' the system web page.

D. Implementation

The system was implemented on a common open-source LAMP (Linux, Apache, MySQL, PHP) platform using CakePHP rapid application development framework. The CakePHP framework is used for development of web applications based on MVC (Model-View-Controller) pattern. Client-side scripts are used at a view level for validation of input on the client-side and for improving look-and-feel of the user interface to the system. A publicly available jQuery Javascript library is used for handling events and improving functionality of user interface elements, like calendars and auto complete drop-down lists. Another important component that is used at the view level is Google Maps Javascript API. Views that display pages with maps are using Google Maps Javascript API for displaying Google Map inside the page, placing markers at desired locations and for handling user generated events on the maps. Maps are used for displaying alumni residence and job locations, and for selecting exact locations of residence and job in alumni profile.

III. PERFORMANCE EVALUATION

Evaluation of the system performance was done by analyzing collected data and by conducting alumni survey. The system is in operation at the FEE since June 2011. The alumni database currently contains 3824 alumni records for the FEE graduates who have graduated in almost last 50 years, beginning from 1965 and up to 2012. Alumni profiles were imported from the FEE student information system with accurate information about the graduates at time of their graduation. Since the majority of the FEE graduates who graduated more than 20 years ago left Bosnia and Herzegovina, it was hard to get their contacts and to invite them to register at alumni web portal. In spite of this fact, 21 of these graduates registered after finding information about them on the FEE alumni web portal by using the Internet search engines. Situation with more recent graduates that graduated in last 10 years was much better since the FEE had official records with contact information that were used to send email invitations. At the time of writing, the total number of registered alumni is 226. Number of graduates per graduation year, and number registered and employed graduates for the last 12 years is shown in Fig. 5. Employment ratio of all registered alumni is 78.86%. Total number of registered jobs is 180, with 110 of currently active jobs.

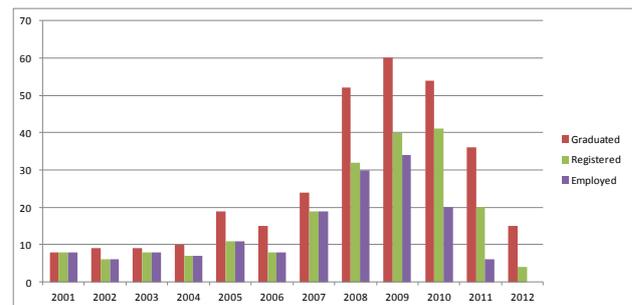


Figure 5. A total number of graduates and number of registered and employed graduates per graduation year

Based on the alumni employment records, the system generates detailed employment statistics. Some of interesting employment indicators are: an average time of waiting for the first employment; number of jobs by sector/industry; number of jobs in public/private sector and number of jobs in the field of study. In total, average time of waiting for the first employment is 1.73 months for 81 graduates. To calculate this indicator, it is required to register data about the first employment in the alumni profile. Almost half of registered and employed alumni did not enter this data into their profiles. The top three sectors by number of active jobs are: power sector (30.91%), public administration (23.64%) and education sector (20%). A total of 77 (70%) of active jobs are registered as jobs in the field of study. Number of active jobs in the private sector is only 18 (16.36%).

The alumni survey was conducted using built-in survey module. All registered alumni were invited to participate in the survey by sending them and email invitation with direct link for accessing the survey. The survey contained statements for getting the alumni feedback regarding their interest for maintaining contacts and cooperation with the FEE, participation in the alumni social events, ease of use of the system, and possible benefits that it could bring to alumni community and the FEE. A total number of respondents to the survey was 90 (42% of 214 registered alumni at the time of conducting the survey). The results of the survey showed positive attitude of alumni towards introduction of the system. There were several useful comments and suggestions from the survey participants regarding introduction of the system and intensifying social activities among graduates and between the FEE and alumni.

IV. CONCLUSION

This paper presented a web-based system designed for efficient collection of alumni contact and employment data. Significance of the system for higher education institutions was discussed, the design and main features of the system were presented, as well as some results of the system performance evaluation. By using this kind of system, connections and relationships could be efficiently re-established and maintained for benefits of higher education institutions and other stakeholders. A confirmation of this is the 63% of registered FEE alumni and interest of almost 95% of the surveyed FEE alumni to maintain contacts and continue cooperation with their alma mater, which is a good starting point for the current situation in Bosnia and Herzegovina and the region. Employment information and feedback provided by alumni could be used for analysis of quality of academic programmes and introducing appropriate measures for their improvement. Employment rates depend also on many other factors in a country, but they could also be interpreted as useful indicators of an academic programme quality and labour market needs.

The system currently has features for connecting HEIs and alumni. Additional modules and functionalities are planned in future work to enhance existing features, and to add new features for involving additional stakeholders

such as employers, labour market, relevant ministries of education, undergraduate students, prospective students and their parents. All of these stakeholders have specific roles in the institution activities, and specific needs for accessing information. For example, relevant ministries of education are interested in employment rates and demands of the labour market as input data for defining admission policies and quotes. On the other hand, prospective students and their parents are interested in the same data, but from the other perspective, when deciding which academic programme to choose. The role of the proposed system is to provide efficient means of communication between the institution and its stakeholders, and to provide tools for efficient collection and analysis of data that could be used for institutional advancement and for benefits of all relevant stakeholders.

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Personal Privacy on Network as Legal, Moral and Ethical Issue

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Abstract - Computers contribute many benefits, but also threaten some of the most important values, such as security and privacy. The key issues of applying information and communication technologies are: privacy, ownership the responsibility, professionalism, social implications and values. In this paper we address one of the most important aspects of using information and communication technology, personal privacy on a network as legal, moral and ethical issue. This paper discusses the role of computer experts in collective and individual responsibility for the protection of privacy.

I. INTRODUCTION

Computers bring many benefits, but also threaten some of the most important values, such as security and privacy [1, 2, 3, 4]. Computers also changing concepts: ownership, buying and selling, right to possession, theft, justice in the distribution of resources and access rights [1, 2].

During the fifties and sixties these problems have not been clearly defined. In the seventies were defined following problems referred to the question of the role of governments and large systems and privacy issues, as well as creating and using large databases. In those years, these problems are more clearly defined.

The eighties were characterized by the development of personal computers, the implementation and use of computer networks in organizations, questions of property rights over the software as well as ways to protect property rights. Hackers are occurring in response to the commercialization of computers, because they did not like the idea that there are property rights in software.

Nineties, the Internet has significantly started to be used in all business segments, resulting in a large number of questions running. In those years, there has been a merging of computers, telecommunications and media, which is further emphasized by the emergence of new issues and strengthening old ones. The problem of democracy has returned to the foreground due to allegations of democratic character of the Internet. In those years, the right of ownership extends to Web sites. They began to appear the problems associated with virtual reality.

II. LEGAL, MORAL AND ETHICAL ISSUES

Key issues of application of information and communication technologies are: privacy, ownership the

responsibility, professionalism, social implications and values.

Regarding the copy of proprietary software may be asking the questions: Is it morally acceptable to copy software with protected property right? Who is wrong and why during software copy and whose rights are protected - the one that has the software, and then it gives the access, or the one who gets access to the software and found that it is useful and installs it together with documents on his computer? Is it justified violation of a bad law?

With respect to the use of data mining, and data search and find correlations between them [5], could be the following questions:

- When customers provide their personal information in order to complete order, and then the data is used in the way that customers are not thought about, whether it is in this case allowed the use of data mining? Can we say that in this case, there is a benefit for the company, and obligations to customers are not respected?
- If the processing of these data primarily to identify groups, not individuals, and their patterns of behavior, whether it can be justified to some extent by the use of this technology?

With respect to freedom of expression on the Internet, in the case where the fantasies of torture, rape and murder related to the real and imaginary personalities, and can either be private and inaccessible to the public or even the public and available to everyone, whether in this case the person is doing something wrong and if person could be arrested for what he has done in virtual reality? What happens if these fantasies in a virtual reality encouraged to crime? In accordance with the above, the question of whether there should be freedom of expression online?

What is and what kind of professional responsibility to inequality and bias in software, especially in designing games for children (because they are primarily intended for boys)? What the experts for software can take to employment in software more attractive women and minorities?

Above mentioned issues entail a number of issues associated with the collective responsibility of experts of computers, personal reputation, the reputation of colleagues and employer reputation. Also, the above-mentioned examples include a variety of problems related to information and communication technologies, and

related primarily to: property rights, privacy, freedom of speech, and professional ethics.

We can think of the following issues raised by the use of new technology [6]:

- Is the use of computers compromised personal privacy?
- Whether computers should be used for all of what they are capable of?
- Over which forms of information technology should be a property?
- Who is responsible for the errors in the software, especially if we have catastrophic consequences?
- Is encryption prevents criminal behavior?
- Is virtual reality leads to introducing people to the world of fantasy?

Undoubtedly there are benefits of new technologies, such as industry development, going to the moon, improved diagnosis and treatment of disease etc. We can also identify the damage caused by the use of new technologies such as the development of biological weapons, cloning, nuclear energy and waste chemicals that destroy ozone, the possibility of monitoring individuals without their knowledge, and eliminating the need for human contact.

Technology progress is inevitably, and with new advancement creates a vacuum in the new legislation, which is not always easy to deal with. New ethical questions that arise are: Is it ethical to set cookies on the hard disks of website visitors? Is it morally acceptable research data? Does domain on the Internet are distributed fairly? Who is responsible for the harmful the information that appears on the Internet? Is computer reconstruction should be used in court? Is it right for someone to electronically reproduce and modify someone else's artwork?

III. NEED FOR INFORMATION AND PRIVACY RIGHT

Information and communication technologies allow such behavioral patterns and activities, which before this technology was not feasible. Computers allow collecting information to the extent that it has never before been possible. Data collection is based on: school records, insurance policies, tax records, data communications, reports on consumption, medical records, travel documents, police records, information on investments and similar. Institutions that collect data are: police and judicial authorities, educational institutions, municipal services and voter lists, tax services, intelligence services, Department of Social Welfare, health care institutions, religious communities, housing associations, credit unions, companies that issue credit cards, company involved in direct marketing, insurance companies, Internet service providers, catalog sales, online sales, banks and other institutions. The question is whether the collection of data threatens personal privacy?

In digital marketing:

- Marketing is oriented towards creating a customer transparent.
- Individual consumers locate on the basis of information about the transaction.
- These data are systematically collected and with the help of expert systems grouped, analyzed and enriched with other data to be used as a basis for digital marketing.

Today, the technology exists for large-scale, permanent monitoring of individuals, so that too much control is done via the electronic archives, not by direct human control or with the help of the camera.

Some authors suggest that it is building a world that would actually constitute a "panopticon". *Panopticon* is a term used by Jeremy Bentham in 1787 to describe his idea to build a new prison. The *Panopticon* prison cell would be set up in a circle, and each cell wall that overlooks the circle would be made of glass. In the center of the circle would be a guard tower, so that each cell was exposed to the views, but the prisoners were not able to see the guards in the tower. Bentham and later, Foucault [7] noticed that supervision has the power to change the behavior of inmates. When prisoners believe that someone is watching them, they therefore adjust their behavior.

Foucault had expressed concern that the level of information gathering in our society has the same effect, or it could have it - building a *panopticon* from which everything we do will be seen and it will haunt us.

Information and communication technologies have changed: the level of information gathering, the types of information that can be collected and the level of information exchange. Data mining provides finding behavioral pattern in a group of individuals with the help of computers.

Some harmful effects of the distribution of data can be:

- Information to be distributed can be misleading.
- The consequences of small errors during the distribution can be multiplied.
- Wrong transmitted information could have negative consequences for some individuals.
- Multiple distributed faults are difficult or impossible to correct.
- Errors of individuals from early age can be a nuisance for a lifetime.

Problems are in the people who use computers, not computers. Information and communication technologies offer people the opportunity to engage in activities which previously could not, which may facilitate the formation of the problem.

Information created, collected, analyzed and exchanged as required organizations to its interests. Information about individuals is used for making decisions about these individuals, and these decisions often have a major impact on the life of the individual to whom it relates.

On the one hand we have a need for information and on the other the right for privacy. Those who want information about individuals they want because they believe they will be helpful in taking better decisions. Companies argue that they need information about customers to help them better provide services. Many people are embarrassed by the amount of information that is collected about them. People do not like it; they do not know who and who owns the information about them and how to use them. Also, people are afraid because they do not have complete confidence in the government and the organizations that use the data [8, 9, 10, 11].

One can ask what privacy is and why is it valuable? Privacy overlaps with other concepts such as freedom, isolation, autonomy, secrecy and control of information about us. Many people think that privacy is a complex and elusive concept. Privacy is seen as instrumental as intrinsically good. If we show that privacy has value because it leads to something else, then it is defined as instrumental good. Then privacy is a means to achieve a goal. The most important argument in favor of the privacy as an instrument or property focuses on privacy that is needed for a special relationship, and that is necessary for democracy. But if privacy is presented as a good in itself, it can stand on its own as it is a value.

Information about an individual is the basic condition for establishing a connection with that person. Information specifies the nature of the relationship. Privacy is important because it allows you to maintain a variety of relationships. Loss of control over information has resulted in the loss of control over the relationship. Loss of control over the information reduces the ability to establish connections and influence their character.

Private and public organizations are powerful factors in the lives of most people. Individuals have very little power in this relationship. Why organizations have a great power and individuals little power in this relationship? One major factor is that organizations can acquire, use, and share information about individuals without their knowledge or permission.

Individuals control the relations established by controlling the flow of information about them. When individuals have no control over the information that others have of them, significantly reduces their autonomy.

If almost everything is recorded in a computer environment, then we live in a world radically changed in relation to the world that once existed. This change brings a very big loss of freedom. This loss of freedom is justified if there is criminal liability. However, the loss of freedom is hard to justify if the man has done nothing wrong.

For continuous monitoring, when a person observes, the person is inclined to adopt the point of view of the observer. Individuals may themselves increasingly come to view as seen by those who watch them. The consequences of observed are [1]:

- Person is publicly observing them as subject to public evaluation.

- The person is prone to act in a manner that is acceptable to the public.
- The person is prone to cultivate and express the most widely accepted view.
- The inner life is less developed.
- Get lost the potential for creativity.
- People lose the desire to turn away from the beaten path and not thinking critically.
- A small number of people are willing to incur the risk that if there is a new expression of ideas and acts unconventional.
- Democracy is in decline.

Possible arguments against are:

- If someone has not done anything wrong, there is nothing to fear:
 - The argument is without merit because false information can drastically affect the lives of individuals.
 - Also, organizations can use inappropriate criteria in decision making.
 - The observation leads to conformism and prevent progressive change.
- Individuals have a certain power to control their relationships with private and public organizations:
 - Price privacy is very high - loss of benefits.
 - What I need to give up in order preserving privacy is more precious than privacy.

Some questions that could be asked are: Why our personal privacy protects weakly? Does it have to be? What we need to take to get a change?

Privacy policy is different in different countries [9]. Example Code of fair information practices which are based on five principles, drafted in 1973 in America, but never passed into law:

- They must be no systems to store personal data whose existence was secret.
- The individual must have a way to find out what information about him there in the file and how it is used.
- The individual must have a way to prevent that information obtained from him is used for any other purpose or made available to others without the individual's consent.
- The individual must have a way to correct or amend the record with information about him.
- Any organization creating, maintaining, using or distributing the file with personal data must assure the reliability of the data for the purpose for which they are intended and must take measures to prevent the misuse of data.

At the global level, there must be control over the collection of information. If there is no adoption of regulations on a global level or to the adoption of regulations that recognize the laws of other countries, privacy protection will be uncertain.

The question is what changes to make to achieve better protect privacy? Some proposed changes relate to the major conceptual changes, experts in computers, technology, regulations, institutions and individual actions. Major conceptual changes that make a great impact on policy regulations regarding personal privacy could be:

- Privacy is not seen as something that individuals want for personal protection, but as a social good.
- To recognize that privacy is worth it no matter that the institutions were less efficient.
- Act to establish the parameters for the collection of public and private information.

Computer experts can play an important role in protecting the privacy: collectively and individually. They can inform the public about issues of privacy and security. Computer experts can take the position to privacy laws relating to electronic documents. They can also highlight the issue of privacy to clients and employers when making a database of sensitive information. Specialists are responsible for ensuring the privacy and integrity of data which describe individuals.

When it comes into contact with the data related to individuals, an expert should try the following:

- To limit authorized access to data.
- To ensure adequate data security.
- To determine the period for which data is stored.
- Ensure proper storage of data.

The potential of technology to protect privacy rather than undermines it depends on the experts in computers. In general, the development of cryptographic techniques enables preservation of confidentiality and integrity of data on the Internet.

As for the rules of the institution, in cases not covered by any law or the law is vague public and private organizations can contribute to the protection of privacy by making internal regulations on the handling of personal information.

Since it is not easy to provide a significant degree of security in society, and it is expensive, Gary Max [3] compiled a list of steps that individuals can take. That list includes some of the following steps:

- Do not give any more information than necessary.
- Do not talk on your mobile phone is not what you wanted to hear strangers.
- Ask for copies of your documentation to verify that are accurate and up to date.
- When you participate in public opinion polls, the information goes to the bank data.
- Information that you provide when purchasing could be sold to a company.

IV. CONCLUSION

Privacy overlaps with other concepts such as freedom, isolation, autonomy, secrecy and control of information about us. Many authors consider that privacy is a complex and elusive concept. In this article, privacy is seen as instrumental as intrinsically good. Collectively and individually computer experts can play an important role in protecting the privacy.

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The Use of Blogs in the Service of the Internet Marketing

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Abstract - The emergence of blogs, as a sort of Web diaries, has enabled a whole new approach of companies to the ways of communication. The use of them enables an informal communication with both the clients and the public, unlike the approach in classical leaflets, brochures and press reports. Beside that, both the public and the clients get a feeling of communicating with a living being, not with a company that strictly sees them as customers and consumers.

In this way, the blogs enable the presentation of personal points of view or of those that a company stands for, while on the other hand, the comments left on the notes show the reaction of the market on the given ideas.

The purpose of this work is to explain the way of the use of blogs with the aim of pointing on their increasing significance as an alternative source of information. All the stated attitudes have been documented by some case studies.

I. INTRODUCTION

In the conditions of a modern business environment, the use of the Internet is getting more and more significant. The digital revolution accomplishes the significant influence on the whole society. Following of these rapid changes becomes an imperative. Only those companies which can follow predict and adapt to the new trends on time, have the opportunity to stay at the top.

Activities on the Internet are becoming more and more intensive; each moment the number of members of social networks, bloggers, comments, sent emails, etc. is increasing. All this has brought up to a number of changes in carrying out the marketing activities related to the traditional ways.

Being the modern way of communication on the Internet, blogs enable the promotion in a whole new way through personalized approach to consumers, branding and building of the positive image. Beside that, they are an excellent means of the critical management. It is needed to use all the potentials given by blogs, not only in a passive way, but also in an active approach, with clearly defined strategy of communication.

II. BLOG AS A MODERN CHANNEL OF COMMUNICATION

Blog is an Internet site on which the notes are published in regular intervals in a reverse chronological order. The term *blog* is a portmanteau of “ Web log”, which means “Web diary”. Individual notes on a blog are called blog notes or entries.

An entry of a blog is usually consisted of: the heading, the body, i.e., the content of an entry, the link for the

whole text the date and time of an entry. A blog site is also usually consisted of a blogroll – other blogs that an author reads or that are connected to his blog [2].

Blogosphere, as a net of interconnected blogs and as social phenomena, has become a significant criterion of public opinion [4].

Some of the most popular topics for blogging are popular culture, stock market and concrete companies that try to promote or to deny themselves.

A successful blog is characterised by the following attributes [2]:

- Personality. A blog is supposed to give to readers a sense of intimacy that is missing on the Internet as a modern media. The readers, actually, have to get an impression of knowing the author, that is, the blog authors, very well.
- Benefit. A blog has to offer to its readers a concrete benefit throughout the qualitative, timely information as well, or throughout entertaining contents.
- Writing style. A blog should give an impression of sincerity. In connection with that, a concise, mild informal writing style is recommended, as well as the use of different analyses and comments from a personal point of view. This is how it's possible to gain the credibility.
- Simple utilize and design. A blog must be created in order to enable simple use. In that sense, it is needed to create the right font, titles and subtitles, file searching systems, etc.
- Ability to occupy reader's attention. A blog must be fun and/or useful, so that its readers keep coming back to it.

The most frequent are so-called *individual blogs*, created by one author. Using the narrative style, an author works on a specific topic from a personal point of view throughout texts, number of pictures and links, as well as video or audio contents. Individual bloggers become extremely influential people, because of which they are present on TV or radio.

The blogs made by a certain section or by a whole company, represent corporative blogs. They enable an informal communication between a company and clients or public, unlike the traditional approach depicted in brochures and press reports. In this way, the potential consumers get a wider picture about the company and relate to it on an emotional level.

Most of these Web diaries are of an interactive nature. In that sense, readers are often given the opportunity to comment. Beside positive comments, readers often leave negative as well, which is why a great number of bloggers retain the right to erase some of those. However, those negative comments are the ones that can urge a discussion and in that way provide credibility to an author, taking into consideration that he or she allows disclosure of different points of view on the same matter. Blogs are being used more and more for the purpose of placing certain ideas to the market, since the reaction on those ideas can easily be recognized within comments left on notes. Even when a message is left without a comment, a blog is useful since it's an obvious sign that an idea isn't good or just isn't well explained. In connection with that, Rvovich cites the point of view of Arianna Huffington, the main editor-in-chief of online news called "The Huffington Post" : "Blogging, in its best form, is deeply personal , and once that readers get used to that way of communication with the writer, it's hard to them to accept anything less " [3].

By a constant bringing of new and interesting topics and contents, a new audience that often spreads the blog texts to other readers through other social networks, and in that way creates a viral effect, is won over.

This is exactly how companies get the opportunity to build a clear and positive image.

III. THE USE OF BLOGS IN DEALINGS

Even though the number of potential consumers that follow what is written on blogs, and who want to get an independent and objective review of a product and /or service and its discussion on the quality, is increasing, a small number of companies practice this way of promotion. In connection with that, companies should understand that blogs and their authors represent a significant alternative source of information, which is why they shouldn't ignore them. Just the opposite-

companies should strive to completely use the potential of blogs.

There are three basic ways of using the blogs in marketing and public relations [1]:

1. **Following of what people say about marketing, about a company and its products and/or services.**

Following the blogs, companies are able to discover the attitudes of potential consumers related to products and/or company's services, in order to find out about its reputation.

The found contents are then needed to be analyzed. In connection with that, it has to be determined on how many blogs the product and/or the service of a company is mentioned as well as if it's mentioned often or rarely taking into the consideration of the product and/or the service of a competitor. Beside that, it is important to get to see both the positive and negative comments.

Finally, it is needed to find a way of using of that information in the purpose of improving the dealings of a company and all of its products and/or services.

Following the blogs, is the easiest way of adopting the etiquettes on blogs, as well as the unwritten rules of acting which will be greatly useful to companies when they decide to leave a comment on a blog, and also for starting their own blog. One of the most important tools when following the blogosphere is given on the site called *Technorati*. In this way it is possible to search a great number of blogs of different categories, and the results are then optionally sorted over depending on the significance or the date.

Analyzing the adequate facts, one can reach the important information that can significantly improve the business strategies of a company.



Figure 1. Technorati site page that enables blog search [5]

2. Participating in conversation by leaving comments on other authors' blogs

Comments should objectively present an author's personal points of view. In this way, it is possible to become famous and to gain a certain reputation on blog. If a company still hasn't started its own blog, it is very important to follow everything that has something to do with its products and/or its services, business branch, etc., on a so-called *blogosphere*. In that way, it will have the opportunity to notice every problem or a discussion about the company led on Web, as well as to react quickly and truly in order to show to the potential consumers that it cares about their opinion.

The "Telekom" company has formed a special team that deals with PR activities on different online media among which blogs take significant place. In this way a company succeeds in speeding up of the communication with the target market segments, by informing them about new services and activities. As the result, there are closer relationships and stronger brands.

Besides of building the positive image, being active in conversations on blogs enables noticing of all those comments that could violate the reputation of a company. By reacting to the public reviews, the potential crisis can be prevented. A case of The United Airlines can stand as an example of this. After having

finished the flight on a plane of this company, the singer Dave Carroll had experienced an unpleasant surprise by finding his guitar broken when he wanted to take his luggage. Since the passengers of a flight had signed the statement by which they agree that the company wasn't obliged to take the responsibility in case of damage, this situation wasn't solved in the favour of the singer. Revolted by this procedure, Dave Carroll posted his video song on YouTube where he criticized The United Airlines.

As a result of all this, the company suffered an enormous financial loss due to cancelling the reservations. So, companies could learn a lesson from this example: only by forming an adequate team, following the happenings in digital sphere, and argumentative explanations given on blogs, the financial situation and corporative image would suffer less damage.

3. Starting and leading a conversation by producing and writing of one's own blog

The tone that is used in writing of such blogs should be corporative but at the same time authentic. In order to provide this, the employee that is the author of a blog should have the total freedom in writing with the respect of the basic rules of the corporative policy. In that sense, it is necessary to avoid criticism made about the rival, stating of confidential information of a company, revealing of business secrets, etc.

FastLane, a blog of the General Motors Company, stands as an example of a successful corporative blog. Thanks to this blog, the company managed together a number of ideas for the new product by inviting the visitors to state their wishes, assuming that its customers know better what they want, than the company itself.

In this way, the potential customers were finally given the opportunity to vote [3].

Blogs are easily created and used thanks to the programme made for that purpose. In this way, anyone can be an author, publisher and a critic. Beside that, this

way of communication doesn't require large means. However, to use a blog in business, in the right way, it is necessary to pay significant attention to blogging. In connection with that, it is necessary to publish the posts constantly, but it is recommended that the time intervals between the two posts remain as short as possible. In this way, the level of being informed increases and the impression of being up to date is given, so the blogger gains trust of the visitors.

The following image shows that 25% - 30% of the authors of the corporative blogs spend 1-3 hours per week blogging.

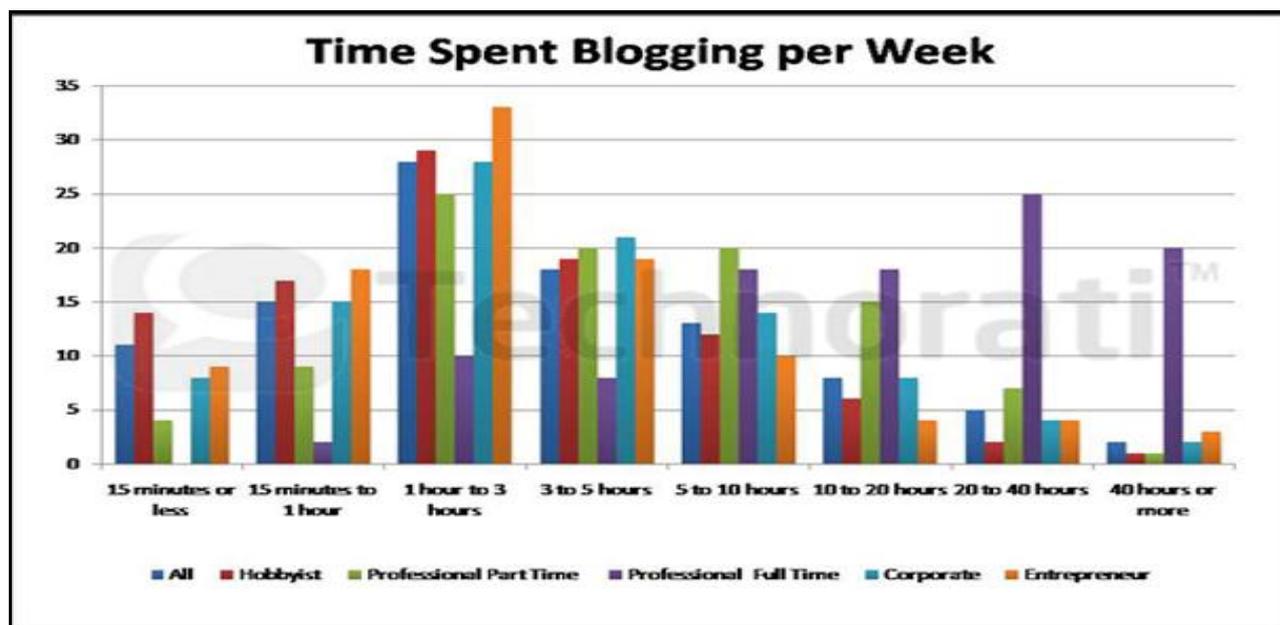


Figure 2. Time spent blogging per week [6]

A blogger should never write about a fictional situation in order to make the contents of a blog more interesting and more persuasive. The quality of a blog should be depicted in objectivity, authenticity and a clear attitude of its author.

After the blog has been created, it is necessary to work on the quality of it, in order to reach the target audience. In that sense, a company is advised to post a link on an official Web site, that is, on its first page and on other pages about the products or the space reserved for the media.

Beside that, the address of a blog should be mentioned when sending an email and a bulletin, and also it should be added to the official signature in electronic correspondence. Since the Internet explorers launch all the regularly updated locations to the top of the list, it is recommended to publish three or four posts per week. The publicity of a blog can be increased also by leaving of comments on similar blogs, with an additional hyperconnection towards its own blog [1].

Taking the given recommendations into consideration, companies have the opportunity to use all the potential offered by blogs being bound to creating of a clear, positive image.

IV. CONCLUSION

The modern society has deeply stepped into the digital era characterized by rapid changes. In a situation like this we make differences between the participant that are proactive and that are progressing and those that are passive and afraid, and disappear because of it. Our suggestion to the companies is to direct themselves towards positive sides offered on the Internet, which is a global media. The result of the communicating on blogs is, above all, the closer communication with consumers, which leads to the increase of loyalty, stronger brands, clearer corporative image, increase of incomes, etc. On the other hand, the potential consumers have many advantages within the use of blogs.

Unlike the traditional media (TV, radio, newspapers, etc.), where the users cannot access the new information

at any time, blogs are available at any time if there is the Internet connection. Beside that, the information on blogs are significantly fresher.

There are few corporative blogs in Serbia and the most common topics when blogging are food and fashion. The situation shows that the consumers in our country believe the traditional media more. However, the modern trends in communication, that is, blogs, have affected all developed countries and there is only a matter of time for the companies in Serbia until they accept these new concepts.

Nothing is possible without a clear strategy based on an integral market communication. In connection with that, it is necessary to make an adequate combination of traditional and modern media sending the unique message.

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International Marketing And Promotion As His Instrument

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Abstract - Companies in their formation are mostly directed towards operating in the domestic market. For this purpose, it examines the market, preparing resources and starts working. When the company's further expansion aims:

- First enter a particular market;
- Then to stay in that market;
- At the end trying to take as much of the market.

But globalization has done its job. Domestic market there are also international competitors. Therefore because of pronounced global trends in operations, competition and the domestic market is getting more international prefix. Uncertain environment, strong competition, the pressure to reduce costs and increase productivity, improve product quality, and a lack of key raw materials and energy, determine the performance of companies in both local and international conditions. Because domestic companies can not wait to be attacked by other international companies, but they are obligated to build and develop competitive advantages for getting first domestic and then international market. But, without any help from government, aid simply turns into one of the biggest enemies of a company, if you can not handle at home, the more difficult it will be to handle in the international environment.

I. INTRODUCTION

Attractiveness of emerging markets determines the number of customers, their billing power and their willingness to use the product or service offered. If the company starts operations, it usually goes with placing smaller amounts of products, whether research shows a need for large quantities, because the people in the company have built confidence, and the risk is always great. On the other hand, there is no better touching the pulse of the market, regardless of major research because the information coming from the field, with real products, market, customers, distributors.

International Marketing has the following four elements:

- Specificity of the international market;
- Specificity in managing marketing activities;
- Existence specificities in international operations;
- Meaning of globalization.

Many buyers are sensitive to verbal and non-verbal communication, because they have to choose words when they advertise a certain type of product in order to guess the subtlety of the message. Realization of international marketing strategies you need to employ language experts, because not every marketing message to be translated literally most languages. If propaganda message to be understood or even be funny, thus absent its promotional sense. Any company that plans to invade a foreign market earlier prepare, raising its capacity as the question of finance, and technology development, marketing, and management. So when you attack the established markets, domestic companies can hardly give an adequate response to the intense attack, if not previously prepared for it. If at the moment of the attack carried out restructuring and consolidation, to meet the attack, the effects will be minimal. Waiting and inaction of the challenges that come from abroad for domestic company to be a disaster.

Certain ethnic, religious, racial, national and patriotic feelings ever determine whether something is going to buy or not. Through propaganda "Buy our" or "do not buy their" can significantly influence the purchase of certain products. Ethnocentrism or forcing their culture or products is often the case. But then there is the threat of competition and they will take reciprocal measures, so avoid direct calls for the use of their own products, and boycotting the products of others. In practice, however, can be observed boycott certain products, which can creating additional chance domestic company to restructure and continue operations. Due to the situation on the world market, international marketing gets more important. Companies who want to be actively involved in international marketing need to be:

- targeted market;
- coordinated business activities;
- international networks;
- adequately fit in the international environment.

Marketing principles apply in all countries with market economies, but still have to enable the marketing department for specifics arising in the international market. For this purpose use the multiple functions of international marketing: marketing planning, designing organizational structures for international marketing, sales forecasting, sales quota and budget preparation, conducting international marketing functions, product

development, marketing, promotion and business policies

Differences exist in some countries that need to be addressed: technical development, various transportation options, the different economic opportunities, language, religion, culture, habits, customs, climate (hot, cold ...) ... To successfully overcome these differences it is the company to hire additional experts. Additional staffing costs to increase aggregate results achieved business or profits. Sometimes there is a big difference between marketing activities of domestic and foreign market, and those activities are ever exactly the same. In case of similar national, religious, ethnic, cultural regions and then marketing activities will be similar and opposite. International companies seek to gain a larger market, using developed technology, developed marketing, strong financial potential, as well as prominent international brands of products. Successful operation of the company depends not only on the operation of a company, but by the operation of complex networks composed of manufacturers, distributors, investors and other financial institutions, insurance companies, suppliers and the like. If members of this network are stronger they can offer more competitive market conditions and better work. All members of these networks have to perform parallel development technique and technologies for their branch, but must invest in employees.

Example: manufacturers develop manufacturing facilities, bankers develop banking services, insurance companies develop services in their own domain and the like, thus strong networks become stronger and is very difficult to internationally.

In the host country, the main reasons for the use of international products: better quality, lower prices, advanced technology, continuous delivery ... Some companies operate independently, some companies are in partnership with other companies, and certain companies working in international conditions through intermediaries if they do not have well-developed their own marketing. International marketing should examine the specifics of the particular market and they specifics to use in the operation. Over time due to the interaction between the company and the environment, the company is able to a certain extent to change the specifics of that market. But the company in the beginning of its operations should not strive at any cost to reverse the specifics of a particular market, but have to wait some differences and specificities of the market over time to gradually disappear.

International marketing activities are expensive and must be set aside funds for their implementation. Overseas marketing activities can be funded: by the state, by a few companies of the same or a different sector or some rich companies. Wealthy companies concentrate their efforts on a promising market, ranking products and services in a form suitable and acceptable for that market, thus becoming richer. The international market can go with exactly the same product and the domestic product with partially modified in accordance with the conditions and needs of a particular market, but it can be done with products that are completely created just for that specific market. Sometimes the type of products requires this kind

of behavior, and once this behavior is due to having or not having enough resources for a particular product is marketed in different forms and different markets. Must be followed and the fact that price willing buyers of a particular market, from different countries, to pay for the product or service. When working abroad should: to pay customs duties, transportation, insurance, transportation, and other taxes, and usually grant lower prices than the domestic market. Sometimes necessary government guarantees to support individual projects.

Operation at the international level is recommended for branches that are drastically changing as electronics, telecommunications, as well as in information technology which perform reshaping economic relations around the world, using the Internet and other software solutions. Satellite communication enabled a revolution in communications. Occur automated and robotic factories in many industries. With such technology companies create a product that is hard to compete. Companies from developing countries while deciding what to take, and buy technology, and train employees wasting time and usually nothing to do with competitive companies and their centers. For the needs of the markets in poor countries some products sold by reparation already used parts and machines. One example is the decision of the German government cash to stimulate car sales performing exchange old for new. But those old cars need to recycle their waste. Individuals are looking for a good source of earning preserved parts and assemblies and selling them as reconditioned parts.

II. PROMOTION AND PROMOTIONAL ACTIVITIES

Promotional activities represent one of the strongest instruments of the marketing mix, the basis of which is communication with customers, or promotion is the company's way of communicating with customers. The goal of promoting better understanding and informing potential buyers of the existence of a particular product, its qualities, and indirectly with the company itself. Companies believe that customers will not buy products or use services that are less needed, so the task of promotion is to convince the buyer to buy the product or use the service. Company must take into account the quality promotion of their products / services, and to promote the company, its technological and moral values.

With promotion to inform, explain and persuade customers to use a particular product or service. It is believed that 80% of people buy or do not buy a product or service as a result of a recommendation. For this purpose, the company engages individuals, athletes, actors who make recommendations for specific products / services that they use. To implement these activities, it is necessary to separate finance and the objectives to be achieved by promoting, as well as to establish a budget for the implementation of the promotion. These investments should be analyzed as a matter of their amount, repayment of funds, expected financial effects and potential risks. Certain companies take into account the interests of buyers and buying, but there are companies who do not care about the interests of buyers after purchase but only interested in the current sales performance. Such behavior may depend on the policy that is developed in a company,

and depends on the product to be purchased. Ex: those who buy expensive vacuum cleaners, which cost several thousand euros, mostly selling middle-aged people. It is very unlikely in our conditions this type of product to sell one or more times to the same buyer. So vendors engage in aggressive sales, over-emphasizing certain uses and features of the product. If you create a negative image for the company, after a period has the opportunity to be reregistered or change the name, some stunt action and sales is again easy. These are short-term, even criminal activities, but in practice can be found. Those who want to work illegally is not seriously interested in the interests of buyers, because any fraud swim to the surface and can not long be hidden. Any good quality offer can significantly increase sales, so each company based on their experiences determines% of its assets going for ads.

Managers have the ability to use four instruments of the promotional mix:

Advertising

Personal selling

Publicity

Promotional sales

Manager uses all four promotional purposes, thereby giving them a different meaning all instruments separately. Example: the company which deals with the sale of equipment, a lot more attention paid to personal sales than advertising or publicity. Conversely consumer goods manufacturers devoting more attention to advertising and promotional sales. The ad has a larger audience, but personal selling allows a direct exchange of views with purchase (any comments, questions, opinions, etc.). Familiarizing customers with the technical characteristics of the product, as well as ways of application specific product more efficiently done by using personal selling rather than advertising.

There several strategies:

Strategy: Change sales organization.

- Tactics: strengthen the sales organization
- Tactics: reorganization of sales in certain regions
- Tactics: hiring additional personnel in sales
- Tactics: focusing on the most profitable products;

Strategy: Change the way of advertising and promotion.

- Tactics: amplification product advertising separate markets
- Tactics: creating new promotional camps
- Tactics: changing methods of promotion.

III. MARKETING PROMOTION

The main goal of the promotion as one of the instruments of the marketing mix is to inform potential buyers and attract them to take action for purchase. So depending on what type will be expressed promotion will depend on the interest of the buyers for the specific

product. The fact is that by promoting the company expects to increase: the frequency of purchase, indicating the different use of the product, increased consumer confidence, turning lack the advantage, breaking the misconceptions, prejudices and the like. Promotion means activities that communicate the merits of the product and to persuade target customers to buy it. It is an indispensable tool in the marketing mix. Promotion, especially with the economic propaganda, creating favorable adopted an approach to the market. Namely certain types of promotion (personal selling, publicity, public relations) are an important means to inform consumers about certain aspects of the product, to then influence their behavior in the purchasing process. This undoubtedly means that the promotion itself particularly significant results can be achieved in the operation of a company. "I think that to sell our or any other product, the most important is the promotion, how to promote our product, advertising our product. Our customers will be able to learn for us to start because it will still be a small company that has opportunities for costly promotion through flyers that will be separated and the most important thing to us will also be mouth-to-mouth (word of mouth) advertising that satisfied customers have to say about us to their friends and acquaintances and they come and buy our product. Website will be opened to promote our products and services we offer. What will be produced and sold will be photo and will be placed on the page to be able to see our customers that we offer. Another very popular way of promotion, especially among young consumers which is also free, open social networking profile on the social network Facebook where you will also find photos of the models they produce and offer.

Catalog you will find pictures of ready made garments that you can order them to be delivered by their measure will be distributed by companies, organizations, perfumeries beauty salons and the like. In the future will increase, we will have a bigger budget for advertising and promotion, ad will go greatest televisions and watched magazines, newspapers, and magazines, Charity fashion shows and fashion show finale which will mean promotion all models. "This is a way of promoting a small company with serious intentions towards its increase, while simultaneously increasing the promotion and achievement of its goals.

Successful product promotions

You have a new product and are wondering how to promote the best way? Every new product needs a promotion and advertising to become known among consumers. How better quality promotion, the greater the chance the product to find its way to a larger number of users. Packing this is the first thing he sees every customer. Packaging should be well designed to attract the attention and the eye of any potential buyer. In addition you should clearly see what kind of product it is and the brand that the product stands. Product information. All relevant details should be visible and clear to read, starting with the basic information to the instructions for use. Ads. When you have finished the design of the packaging remains good to advertise. We recommend you use a variety of sources and track how many potential buyers

you wear any of them. Where you can advertise your product?

Internet. Day by day more consumers seeking product information on the Internet and you want to learn more about your product. To do that you need a nice website, where you provide basic information about the product, experience and feedback from customers, contact details and price.

Billboards. This is probably the most expensive option, but will pay off. You can rent one or more through your city and promote your product.

TV ad. And this is an expensive kind of promotion, but if you choose the right TV your product will be especially prominent.

Brochures.

Newspapers and magazines

Radio. ETC. ETC.

IV. CONCLUSION

Based on the above mentioned promotion is instrument through which the company establishes a direct or indirect communication with the consumer. So depending on what signals gives the promotion enterprise knows what strategy short, medium and long term. Through market research company creates a picture of that market, and depending on it will form its promotional strategy. Promotion as an instrument requires a high level of creativity. Namely the promotion is instrument that requires specialists with a high level of creativity and uniqueness while creating promotional strategy. Thereby it is perceived and how the company is successful in combining promotional media and channels, changing the

structure of information, adapting to the needs of customers in different markets etc.. Depending on the company and type of business promotion will have its own distinctive feature. Different promotional form and different impacts in different buyers. Because enterprise marketing managers need to know which products and which markets, what type of promotion is most appropriate. Good promotion requires the company has a relatively high budget would allocate high finance as financed promotion. The fact is that the world's largest companies such as Coca-Cola, McDonald's, Microsoft have the best promotional activities. Also in Macedonian companies a major handicap for the weak promotional activity is precisely the low financial means to pay for a good promotional activity. The only way to cope with competition especially in Macedonian companies is just investing in promotion that will highlight their products / services. Enterprise through a good promotional campaign can very quickly get out of the abyss of the global economic crisis and stepped toward the conquest of new markets.

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Importance of the Social Media and their Integration in the Internet Marketing Strategies of the Companies

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Abstract - The Internet is becoming an indispensable tool for the individuals and business community. Modern life and contemporary work are heavily based on Internet. Consumer behavior and their expectations are changing. Knowledge of the consumer behavior represents an important element in building a successful marketing strategy. For a modern company today it is necessary to make analysis of their customer's behavior that will assist in developing strategies for their retention and attraction. Social networks play an increasingly important role in this. Nearly 4 of 5 active Internet users today are active users of social networks. According to the Internet World Statistics data the number of social media's population continues to grow. Today, understanding of the influence of social media is becoming crucial for the business success.

The purpose of this paper is to present the needs of companies for incorporating social media into their online marketing strategies.

I. CONSUMERS OF INTERNET SOCIAL MEDIA

The social media represent an integral part of everyday modern life of almost every person today. The social media are becoming significant source of information used by consumers, especially during the search phase when they are trying to make a purchase decision. On the other hand, the increased usage of social networks enables the companies to take care of brands and to influence the purchase process.

The social media is a tool for communication, presentation and cooperation of the companies with their existing and potential consumers, where the information flow is bidirectional.

There are many kinds and ways of classification of social media.

The generic types of social networks are the following [1, 715-716]:

- General social networks – place on the Internet for gathering and meeting friends, sharing

content, schedules and interests (Facebook and MySpace e.g.).

- Exchanging experiences networks – networks for professionals and practitioners, handicraft producers, software developers or musicians (LinkedIn for business and JustPlainFolks for music e.g.).
- Networks created according to interests – networks built according to interest for sport, music, finance, politics, life-styles, etc. (E-democracy - for political discussions e.g.).
- Sponsored networks – networks created from commercial, governmental and nongovernmental organizations for different purposes.

In this paper we will make a review of the general social networks and experience exchanging-networks (professional networking).

The social media not only connect individuals, but provide personalized way of communication of companies with their consumers, so that they become significant marketing tool for the companies. Researches show that consumers use social media as a source of information for products and services. The presence of the companies on these social networks enables them to increase the number of consumers and the opportunities for purchasing and informing.

Each company which wants to satisfy the consumers' needs should actively approach to the implementation of the social media into their business strategy. Ignoring this media means ignoring million existing and potential consumers who are presence on the social media every day.

Facebook, Twitter and LinkedIn are on the top of the list of social networks and they become the most popular between the consumers and companies. The number of consumers of these networks increases every day and therefore the company's plans and the performance of these networks change.

Facebook is the biggest and most popular social network where the friends, colleagues, relatives, companies, organizations etc. can connect each other and can communicate and share information, links, contents, photos etc. Facebook offers great opportunities for business and it is a social network that changes the view of the world and people's life and attracts several thousands of new users every day. On this network, there is an opportunity to create profile, group or page. While the individuals mostly create Facebook profiles sharing their photo and other basic information for business, brands, products and services is more convenient to create a page or "Facebook page". With selecting the "Facebook for Business" option, the companies have the opportunity to see all the functions and features that Facebook offers for the business users.

According to data for year 2011, Europe is at the first place with 223.4 million Facebook users (out of 900 million Facebook users registered today); second is Asia with 183.9 million and third is North America with 174,600,000 users [2].

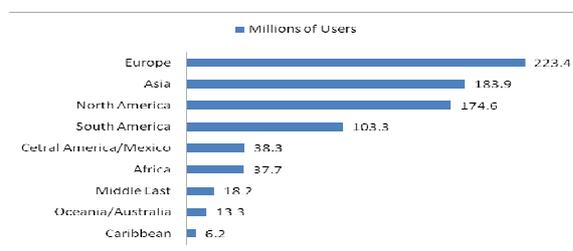


Figure 1. Facebook users in the world by geographical regions - 2011

According to the rate of Facebook penetration, Europe is on the third place, or 27.4 percent of total population in Europe uses Facebook. The first place has North America with 50.3%. In Republic of Macedonia out of 1,069,32 Internet users (by the end of 31 December 2011), 879,540 use Facebook or 42.3 percent from the total population of the country is present on the Facebook social network [3].

LinkedIn is a social media designed to connect professionals and businesses, enabling them to share information, get replies and promote themselves and their businesses. LinkedIn is network which provides networking and making business contacts. At this network the users can create profile with photo and short review of information for professionals and/or business careers and achievements. The profile is a base for connecting with other LinkedIn members. The text contained in the profile is searchable through the network (and popular search engines, Google e.g.) and enables connecting with appropriate companies or professionals.

Twitter is a network which enables the registered users to send or receive short messages known as "tweets". This network has about 300 million users, students, professionals, organizations. The companies use Twitter as a communication tool for realization of their marketing goals. Also, companies can share information about products and services, follow the competition; inform for everyday events and answer questions to the consumers. This network offers great opportunities for the companies,

but also requires active participation, so that asked questions and negative comments can be answered on time.

There is no doubt that social networks are integral part of each individual and gradually change people's life and behavior. Not joining these networks reduces the opportunity for easier communication, access to huge volume of data, fast information, learning etc. At the same time social media networks change the companies' environment and the way of creating business strategies and operations.

II. INTERNET MARKETING STRATEGIES FOR ESTABLISHING CONTACT WITH THE CONSUMERS

Internet technology provides better opportunities for companies to establish recognized strategic positioning in relation to previous generations of information technology. It makes strategy more necessary than ever before. Internet companies can be top winners - if they understand the compromise between Internet and traditional approaches and if they are able to create really distinctive strategies. Internet architecture, together with the other improvements in the software architecture and development tools, has turned internet technology in more powerful strategic tool [4].

The development of the Internet and web technologies provides appearance of new marketing and internet marketing strategies. Attracting consumers is the first step in creating successful business, but after that another significant step follows – maintaining and managing consumers. Significant Internet marketing strategies for establishing connection with consumers are: affiliate marketing, viral marketing, permission marketing, search engine marketing, advertising networks etc.

Affiliate marketing is a type of agreement between groups of associates, from one side are publishers (also known as 'the affiliates'), that display advertising on the Internet, and on the other side are the marketers whose aim is to attract consumers and to increase their online sale. The most common tool for affiliate marketing is the "banner"¹ from the online marketer that is placed on the publisher's website (owner of the website) for specified compensation (based on visitor's click, sales or leads). By clicking on the banner, the consumers are redirect to the marketer's website. The affiliate marketing relies purely on the financial motivation to drive sales, and that is the main difference with the referral marketing where the main motivation relies on trust and personal relationship. Amazon.com for example has strong affiliate program and its logo can be seen by around 1 million affiliate sites. Smaller online companies and individuals with significant traffic on their websites use affiliate marketing through

¹ Banner is a common form of advertising on the Internet. The banner is an advertisement of 460x68 pixels, usually placed at the top of the page and is intended to attract traffic to a website by linking to the website of the advertiser.

joining to third-party services provided by intermediaries to track traffic or sales that are referred from affiliates.

Viral marketing refers to an internet marketing strategy that encourages consumers to communicate the marketing message to others (friends, colleagues, relatives etc.) with the opportunity to spread the message and its influence exponentially. This strategy enables the message to be spread quickly to large number of users, such as the case like viruses. Viral marketing can be used by email, group messages, forums, Chat rooms, social networks etc.

To make the viral campaign effective, Justin Kirby, a viral marketing specialist (www.dmc.co.uk) suggest three unnecessary points [5: 401]:

- Creative material – “viral agent”. This includes creative offer or message and how can it be spread (text, photo, video)
- Plating. Identifying to which websites, blogs or people the email should be sent to, so they can begin spreading the virus.
- Following. To follow the effect, to evaluate cost recovery from development of viral agent and plating.

Permission marketing or known as “opt-in e-mail” presents internet marketing strategy used by companies, so that they ask the consumers for accordance to send them commercials and other marketing materials. Most often companies on their website give an option for registration with email in order to get news, catalogues and other information from the company owner of the website. With every received message on email, the consumer has an option to logout from the page if he doesn't want to get commercial materials from the company any more. An opposite of this technique is spam usage that means sending unwanted message via email to the consumers. The usage of mailing list for sending information about company and its products and services is popular way of advertising, also known as *email marketing*. Email messages can be combined with specified photos, videos which promote the product or URL (Universal resource locators) addresses. This strategy enables to reach the preferred consumers cheap and fast. Forming email lists is powerful tool for targeting consumers.

Search engine marketing is internet strategy that enables promotion on company's website at the web search. A lot of engines enable the companies free submitting of their Internet addresses, called URL so that their URL can be searched electronically.

Ad networks provide advertising opportunities for companies who want to promote their products and services to internet consumers. These sites are usually called web publishers. Ad networks share the revenue with the publisher. This networks developed software that follows consumer's movements among the network members (Amazon, Google, Yahoo, eBay e.g.). At each visit the software for network advertising decides which banner ads, videos and other advertisements will show the consumer the different sites in the network. One of

the most popular networks for advertising is Doubleclick.com [1: 388-389].

Commonly known consumer retention strategies are: personalization, customization or user adjustment etc.

The internet marketing strategy facilitates the communication of the companies and their consumers using blogs, online games, internet radio, internet TV other and social media tools.

III. SOCIAL MEDIA INTEGRAL ELEMENT OF INTERNET MARKETING STRATEGIES

With the revolution of social media consumers worldwide become very most powerful. They forced companies to think about how to become more transparent and responsible. Social media enabled companies in times of economic crisis to learn how to do more with less money - to receive messages from consumers, to spend less money on classic media. People want to share and feel connected to others, brands, organizations and even governmental institutions that they love and trust. Facebook Like button, introduced in April 2010, has already been added to more than two million different web pages. This button enables more than 900 million users with one click to express approval of the company, organization, product or idea. Social media look like the world's largest cocktail party where everyone can hear what others say and join the conversation with someone else on any topic of their choice. But there is a difference between the real and online entertainment. What is significant in the first, there is a conversation with many people in one night, but online and via social networks there are numerous conversations with thousands or millions of people at once. And in the both parties will be found pleasant and unpleasant people [6: 4-6].

Some reports [7] confirmed that consumers who log on to Facebook once a month and buy least quarterly, 62 percent of those buyers read comments from their friends related to the products. These comments help consumers to learn about products, and to 48 percent of them social sharing helps find information about products.

For the companies, research shows that their presence on social platforms and strategic involvement in discussions of social networks is aimed at supporting business goals, fostering favor of consumers to the brand and creating additional value. At the 64 percent of the companies, structure and roles within the marketing department, human resources and public relations have changed significantly as a consequence of social work, while most companies today (80 percent) regularly carry out some form of measuring the success of their activities at the social media, but also face challenges in measuring the scope of the external public. In seeking ways to measure the return on investment in social media, 84 percent of companies are focused on information from the target public engagements on social networks, 69 percent follow the number of messages, 53 percent analyze the attention

that they have achieved, and 51 percent assess the tonality of the message and the feedback from the target audience [8].

Marketing on the social networks is moving with quick steps. Companies seriously incorporate it into marketing strategies and very carefully follow and communicate with many customers present at these media. Even for 42 percent of the companies today, Facebook is critical or important to their business [9]. Strategy performance of companies on the social media should include several important elements: they will promote (which products and services and on which target group), their registration on social media (social media selection and registration), finding appropriate manager of social media such as Ping.fm and Hoot Suite, prepared plan for updating, with whose realization will provide valuable information about the company's work, a way of finding friends and followers, active involvement of friends and followers and plan for continuous active performance [10].

A lot of companies adhere to many rules when it comes to social media marketing. Companies preparing plans for publication, monitor comments, use tool for managing announcements, doing promotions and recruiting fans and have separate teams responsible for social networks. One such example is a "Bozinovski - Watches and Jewelry" company that integrates social media into their marketing strategy. This company uses the tools of hootsuite.com monitor the comments and posts on social media. Tools of wildfireapp.com are also used to create interactive promotions on social media [11]. The fact that this company has over ten thousand Facebook fans shows the effective approach to social media.

eMarketer [12] predicts that for advertising on social networks 7.72 billion dollars will be spend in 2012, including paid advertising on social networks, social games and applications. Growth in 2012 will be faster than in 2011, although in 2013 and 2014, eMarketer expects growth rates to fall, but still remain with double-digit figure. By 2014, eMarketer expects nearly 12 billion dollars going to advertise on social networks worldwide. Nearly half of that money has come from the U.S. and little changes in the predicted period are expected. In 2012, the U.S. for advertising on social networks will spend 3.63 billion dollars compared to 2.54 billion dollars in 2011, and continue to climb to 5.59 billion dollars by 2014.

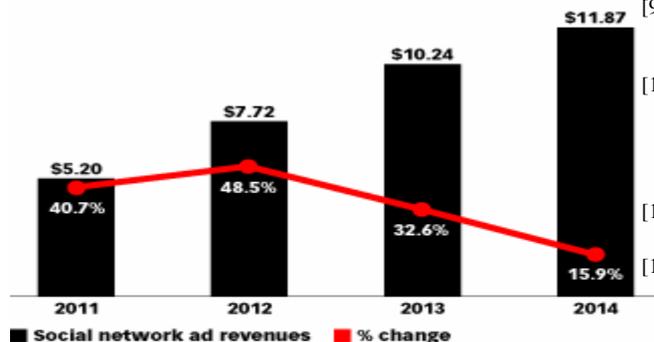


Figure 2. Social Network Ad Revenues Worldwide, 2011-2014 (billions and % change)

There is no doubt that social media become a major business media, which should be integrated into the online business strategy to be enable to reply to the new consumer environment and increase their number.

IV. CONCLUSION

In the new Internet environment the companies have to be consumer-oriented to be competitive on the market. Consumers represent the most important part for the company. The company can provide long-term competitive power only through solid long-term relationships with consumers. Internet sites for social networking and blogs on the internet have bigger impact on consumer behavior. The company's presence on social media gives them the opportunity to reach a wide range of people, to present their products and/or services, to communicate with existing or potential customers, answer their questions, to adapt and to analyze the needs of consumers. The consumer, however, who will visit the social profile of the company, will receive more information about products and services of the company. Hence, the companies that will integrate elements of social media marketing strategy have a greater ability to influence the consumer's decision to purchase.

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Mediators in Electronic Insurance and Reinsurance

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Abstract – The role and importance of mediators in electronic insurance and reinsurance is elaborated in this paper. In this matter primary types of such electronic business models are classified with description of their most important characteristics and operation models. Analysis of individual cases has been observed through concrete examples. It has been found out that electronic mediators in this industry are extremely significant inter-mediators. However, their establishment on small insurance markets is the most often limited to the high investment costs.

I. INTRODUCTION

At the end of last century it was considered that appearance and development of electronic business in insurance branch will gradually lead to disappearance of physical mediators in this industry; agents and brokers in the first place, but also travel agencies, real estate agencies, car dealers, banks, loan institutions and other similar mediators, who, as well, may deal with insurance products sale in certain countries. On the other hand, financial reports in large majority of states indicate that these so-called traditional mediators still achieve a significant contribution in insurance products distribution [2]. Besides this, traditional mediators start to use Internet both for promotion and direct sale of insurance policies. In this sense, they create their own blogs, simple web sites or they advertise themselves through the public networks (Internet advertising) where they are able to connect with other people.

Traditional mediators have not disappeared, on the contrary; there are a new kind of mediators appearing in the field of electronic insurance and reinsurance. Here, used electronic insurance formulation is taken from the United Nations Report on electronic trade and development 2002: „E-insurance can be broadly defined as the application of Internet and related information technologies (IT) to the production and distribution of insurance services. In a narrower sense, it can be defined as the provision of an insurance cover whereby an insurance policy is solicited, offered, negotiated and contracted online [4].“ New type of mediators in the insurance and reinsurance industry, in the field of electronic operations, includes aggregators, reverse auctions and electronic reinsurance markets. Scope of this paper are exactly these electronic marketplaces and getting acquainted with their fundamental characteristics and operating models.

II. AGGREGATORS

Aggregators (navigators) are electronic marketplaces¹, the primary goal of which is the comparison of different insurance corporate products, regardless of whether are they already present on the Internet (presentations, portals and similar), or not. In difference from sites of insurance companies that started with presentation, in the large scale, after 1996, and up-to-date the large number Internet presentations had been set offering information on insurance, mostly by aggregators [1]. There are a numerous extraordinary examples of aggregators today, which financially justified their business activities (InsWeb, Pivot, insurance.com, QuickQuote, Quotesmith, Einsurance, InsuranceCity, MoneyXtra and many others). However, such electronic marketplaces mainly exist on large insurance markets, namely, in big states, such as USA and states of West Europe (Great Britain, Germany, Spain, Italy). Aggregators are still not present in Serbia since it is small insurance market.

Except organizers of those market places, buyers and insurance companies gain multiple benefits. Considering the insurance policy buyers, the most mentioned utilization benefits in literature of this electronic insurance model are:

- possibility to compare insurance products of different insurance companies on independent electronic market;
- accurate insurance quotes guaranteed by insurer;
- confidentiality of purchasing without pressure by the buyer.

Insurance companies also achieve a series of benefits and the most mentioned are:

- lower prices of consumers' service;
- increased offer of products and operation cost-effectiveness;
- avoiding of negative selection among increased population of technologically oriented consumers purchasing online, i.e. a selection of high quality consumers where the possibility of loss occurrence is minor.

¹ Electronic marketplace may be described as an electronic system supporting at least one of the classic market functions (product research, price negotiation and sales conditions, payment, delivery, warranty claims and other similar functions).

Aggregators could be split into two basic groups: online brokers and online suppliers of independent comparisons.

A. Online brokers

Online brokers, first of all, collect from possible clients all information necessary for selection of appropriate quotes, than deliver such information to one or several suitable partners meeting the best the criteria of clients' requirements. These are agencies, agents, brokers, insurance companies, in other words, all interested providers of insurance products and services, previously registered and paid to aggregator the adequate commission. After this, selected local insurance provider shall address to client and complete the policy sale process whether in traditional (offline) or online way.

Online brokers, as well as suppliers of independent comparisons, mostly require the large number of data from possible buyers in order to select conditions (quotes) that are suitable the most for individual buyer. However, this brings to a certain intrusion into individual's privacy, even if meets their needs well on other side.

QuickQuote company can be mentioned as an example of online broker that exists since 1995. This electronic broker successfully operates even today (in all 50 USA states plus the District of Columbia) and continuously increases the number of business partners. The number of insurance companies it concluded contracts with and recommends their insurance policies is 20 so far, but its primary goal is work and conclusion of contracts with traditional brokers and agents, aiming the improvement of their insurance policies sale. Monthly commission for these clients amounts \$49. Here should be pointed out that at filling in of applications the buyer is not requested for contact and personal information in exchange for quotes, in other words, individual's privacy is guaranteed [12].

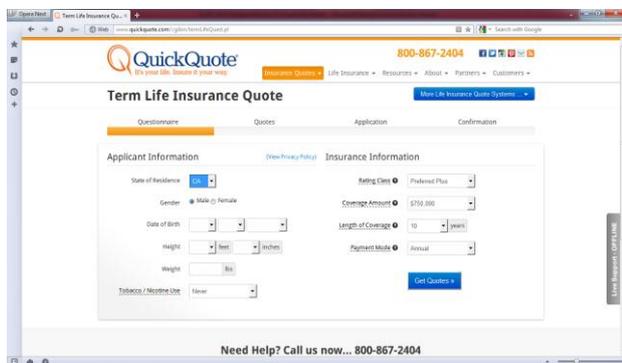


Image I. Application for providing of personal client's data (gender, date of birth, height, weight etc), on which basis the best quote of term life insurance will be selected online at QuickQuote

B. Online suppliers of independent comparisons

Online suppliers of independent comparisons provide to prospective clients the comparison of products and quotes of various insurance companies. Prices are directly sent to consumers online or with certain delay, while the consumer anonymity is guaranteed. So, difference in

relation to prior model is that clients may select local insurance provider by themselves, according to the quote list provided by aggregator after obtained all required information online. The same as brokers, the independent providers present quota in order to meet the needs not just of individual clients and insurance companies but traditional agents and brokers, who, among many insurers, want to offer to their clients confirmed and first class products.



Image II. One of web site presentation of quotes provider InsWeb

There is a large number of independent providers and common to all of them is offering of possibilities to compare quotes of different lines of business (car, household, health, life etc.) with listed carriers for each type of insurance. After selection of adequate line of business, it is necessary to insert postal country code where the client wants to be insured and after this, the client is to be requested for a lot of information while the privacy and data protection are guaranteed. Besides this, there are other information provided on sites, such as expert's advices, texts and articles on certain types of insurance, case studies etc.

InsWeb company can be mentioned as independent comparisons provider which was established in 1995 as well, and according to its founder and manager Hussein A. Enan, passed a thorny path to success. The idea to establish this company he has got when saw his son buying a CD via Internet. Than he asked himself why not to establish the similar shopping market for insurance buyers. However, the company finally operated with profit after 12 years, concretely in 2007, after invested \$ 300 mill.



Image III. InsWeb company head office in Gold River (California)

The large part of success is attributable to year 2004 when company changed business strategy involving the

traditional agents as its clients as well [3]. Today, InsWeb has over 50 employees, operates with 19 insurers and over 5000 agents. Each year more than 15 million insurance consumers seek from this company to answer their questions. In December 2011, InsWeb was taken over by Bankrate.com, leading aggregator in insurance industry, but it still operates under the same name [14].

III. REVERSE INSURANCE AUCTIONS

Reverse auctions present less represented model of e-business in insurance, initiated by insurance beneficiaries. Namely, clients use Internet in order to invite insurance companies to tender and in this way select the best insurance conditions.

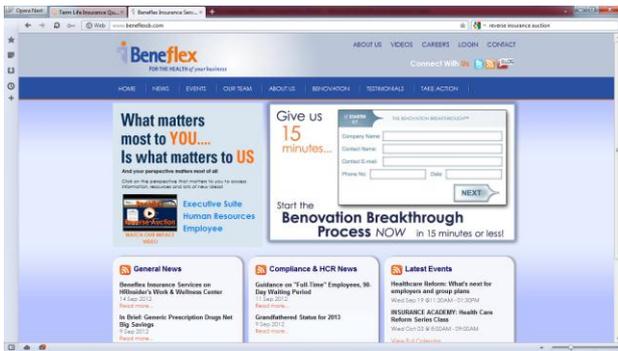


Image IV. The Beneflex company web site which organizes reverse auction in purchasing of various insurance products for employees (group life, long and short term disability and voluntary employee benefit offerings) from large companies

It should be borne in mind that such selection of insurer is characteristic for large groups of clients joined by common interest, since that insurance companies may be interested to respond just to one or a few clients. Of course, this is not impossible because we saw above in paper that such transactions are taken over by aggregators.

Accordingly, reverse auctions as a model of e-business are mostly used by large corporations or consumers' associations (for example, car associations etc.) who want to provide to their employees or members, if associations are in issue, the most favorable and the best possible conditions for coverage of various risks. Here they decrease from 20% to 40% of their acquisition costs for such coverage [11].

IV. ELECTRONIC REINSURANCE MARKETS

Development and application of information technologies and electronic trade in reinsurance are intensive. There are numerous cases of success, but reinsurance companies select different ways of approach to the new technological challenge. Large number of them decided on online marketing support and distribution at their own sites. However, certain companies have decided on alternative ways of electronic data and funds exchange within the reinsurance business, aiming the organization of common market platforms. Goal of this integration is in increased process efficiency and reduction of transaction costs associated to reinsurance business independently of interest of any other participant. This is about electronic reinsurance markets or so-called online risk markets representing a

recent model of electronic transactions in reinsurance based on B2B (business to business) concept of electronic exchange.

Online risk markets may have mediatory role on classic insurance market in the part of the corporate risk insurance, but they are primarily of significance to reinsurance in a sense that the basic function is online connecting of insurers, brokers in reinsurance business and reinsurers.

First platforms for electronic transactions in the field of reinsurance appeared in late 1990s. It can be said that The Catastrophe Risk Exchange (CATEX), as specialized producer and provider of web based insurance and reinsurance systems, was the first one that launched web based platform for risk exchange in 1995. However, significant risk exchange on this electronic market will come later on, simultaneously with Internet development and increased number of its users, i.e. since the end of 1998, when Internet version of Catex platform was provided [7]. After this, the number of new electronic risk exchange platforms appeared (dotRisk, RI3K, inreon, ReWay, eReinsure, Risk2Risk, reinsurer.com, MyReinsurance.com, Kinnect), but fate of the most of them was not so bright as it was a case with Catex which exists up-to-date and operates relatively successfully [8].

In 2009, Catex company completed development of the Pivot Point 2.0 version which presents revised version of the original Pivot Point system. This system, in fact, presents integrated web based software (in Microsoft environment) enabling brokers, insurers and reinsurers to manage electronically their reinsurance business. This includes negotiation, precise calculation and accounting control, claims management and settlement of claims, multi-foreign exchange settlement, processing of „bordereau“ transactions, namely, insurers' requirements referring to collective reinsurance of several risks at once. Today the CATEX is the only developer in the world which completely comprised entire life cycle of risk transactions (insurance or reinsurance) via web based system with access from all over the world in any time without necessity for installation of any software. At the moment, Pivot Point system is used in twenty different countries and it is developed in six languages.

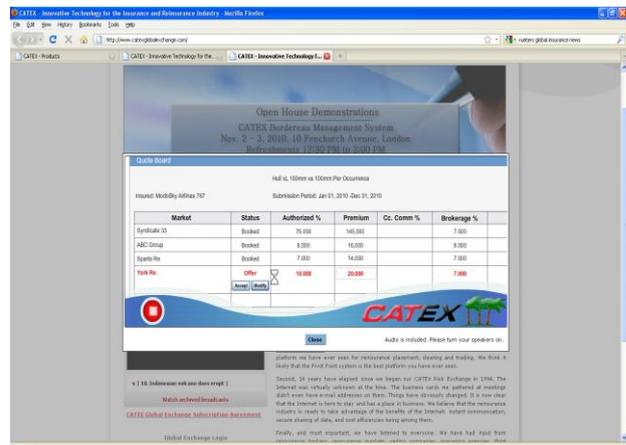


Image V. Appearance of one of windows for electronic communication between cedent and broker, Catex Global Exchange web platform

Hundred users worldwide are engaged at this system all the time, and over 4 billions USA dollars value of transactions associated to premium and reinsurance claims payments are carried out via this system [13].

Besides Catex, the projects RI3K in Europe (London) and eReinsure in USA (Salt Lake City) are met with extremely important competitors, survived all turbulent processes and after all challenges succeeded to achieve profitable operation. Except these platforms, there are absolutely new projects appeared after 2009 (Lloyd's Exchange, Rüşchlikon Initiative and Qatarlyst), but just Qatarlyst, as a market intended to the Middle East area, got out from initial (pilot) phase and has a great chances for success and existence in the field of electronic reinsurance business [16].

There are divided positions in the field of reinsurance whether the web sites of individual reinsurance companies are to prevail as modules of electronic business or online risk markets. In this sense, certain comparative preferences and deficiencies of electronic insurance markets are mentioned. Comparative advantages would be:

- Reinsurance product buyers have a possibility to get the insight in quotes and proposals of different reinsurance companies.
- Electronic market capacity may be much larger than individual corporate sites.

The most mentioned comparative deficiencies are as follows:

- Not all business partners are committed and loyal and many of them develop their own solutions at the same time.
- Standardized products may not be able to meet the needs of all customers.

V. CONCLUSION

Concept of electronic insurance understands strategic enlargement of business activities of existing insurance and reinsurance companies, but completely new models of Internet business models as well. More accurate, the new types of mediators present themselves in insurance and reinsurance industry, performing the business activities via the Internet. These are aggregators, reverse insurance auctions and online risk markets.

Each of those new mediators provides many advantages for both (re)insurance companies and

(re)insurance buyers. Their involvement provides a higher level of intermediation in this industry and it directly contributes to economic development in general. However, this is about extremely expensive projects requiring the large number of involved parties. Therefore, profitability of investing into such marketplaces may be achieved on larger insurance markets in general, and thus their presence in certain countries is conditioned. Insurance market in Serbia is relatively small with limited utilization of Internet business activities so above models of electronic business are still not represented.

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Online Teacher Education - Example, Research, Observations

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Abstract - This paper gives a review of practical Internet application in professional development and teachers education in the field of information and communication technologies. A short inside of accredited online seminars to promote IT competencies of educators is given. The seminar was followed by research toward e-learning, motivation and success of this kind of work and learning. Some results of research and observations of the participants after the seminar was presented.

I. INTRODUCTION

Economic and social prosperity of modern state is in relation to the paradigm of "knowledge society". The term is usually applied to a highly developed country whose economy is based on the use of knowledge and new technologies. The UNESCO global report from 2005, entitled "Towards a Knowledge Society" states: "For the link between knowledge and development is fundamental to the building of knowledge societies– knowledge being both a tool for the satisfaction of economic needs and a constitutive component of development." [1].

With the rapid development of science and technology, knowledge production is rising dramatically. Advent of computer and new internet technology has caused very fast knowledge changing and technologies to become obsolete. The need for change is felt both in industry and in education, with the exception that the educational system is inert and slowly changing. For successful application of new knowledge and new educational technology, in teaching and learning, it is necessary to harmonize all elements of the changes in the curriculum, physical and technical requirements, and teacher training.

The paper gives a review of the practical application of the Internet in teacher training. A short inside of accredited online seminars to promote IT competencies of educators is given. The seminar was followed by research toward e-learning, motivation and success of this kind of work and learning. Some of the results, which illuminate the subject of work will be will present in this paper.

II. EDUCATION IN NEW TECHNOLOGICAL ENVIRONMENT

According to figures and estimation from the International Labor Organization, in September 2012, about 200 million people are unemployed worldwide, of which about 75 million are young people [2].

On the other hand, paradoxically, there is a great need and a growing shortage of people with the skills required by the 21st century. The reason is as in [2] that systems for educational and vocational training are not compliant with the requirements of employers and companies in terms of technical, non-technical demands and skills. Unfortunately, often happens that the people who are studying are not necessary in the industry ("skills mismatch problem").

Speaking about the transformation of educational system in Africa, Claire Ighodaro, an independent director of the British Council in Africa, said: "Our common future depends on releasing young people potential. We cannot predict what's ahead, but we know that tomorrow's world will be complex and fast-changing, and that there will be major challenges ahead. This new world demands a whole new set of skills. Alongside competence with IT, they will need superb communication and teamwork skills to understand and work with people in their schools and communities." [3]

An example of visionary planning the future of their economy is Estonia in whose schools from September 2012, began the implementation of a pilot program called "ProgeTiiger". Their K12 students will learn to program and create web and mobile applications. First phase of the program will be implemented in pilot primary schools after their teachers undergo proper training during the month of September. Next year the project will cover high schools and colleges. [4]

This is supported by research of Oxford Economics in first quarter of 2012, which predicts that developed countries (UK, France, Germany, USA, ..) will not have anymore a "monopoly to have smart people doing smart things in a smart way" [5]. A new geographical distribution of talented and professional people is changing in favor of developing economies, and that will happen in the next 10 years.

These are examples of a developing society realize that with the rapid development of technology and its wider application all have the opportunity to advance only if they constantly invest in the education of young workers and training for employed. Serbia should recognize a chance and invest in education.

Investment in education is not just about investing in space and equipment, increasing the salary for employees, changing outdated curricula and textbooks, but implies greater investment in professional development of educators. The technological revolution has left many teachers in the distant past. In average terms, the majority of currently employed in the education was completed

their education, 15-20 years ago, when many of today's current knowledge, especially in the world of information and communication technology did not exist. Therefore, teachers are an excellent example of the need for investment in their education and the importance of the concept of lifelong learning.

Even in the job description of employees in education is constant advancement and active monitoring the changes in the science and profession, very often are appearances that students know better the new digital technology. By M. Pivec "You can not expect all teachers to know how to integrate the new virtual environment in their lessons to achieve the desired outcomes. Digital technology may require a considerable amount of time to learn, and very often with students who know more than the teacher "[6]. Education of teachers in this field is important because effects are very positive, and increase opportunities for students [7]. Oxford Economics recommendation is: "Creating digital literacy should be considered almost as important as basic literacy, and even primary schools should be encouraged to find ways to bring the Internet and related digital technology into the educational experience." [5]

Although the students (by Hargadon S, 2008) "maybe the "digital natives" but their knowledge is at the surface level, and they desperately need training in thinking skills. More than any other generation, they live lives that are far apart from adults around them, talking and sending text messages via mobile phones and connecting online. We may be afraid to go into that world, but we have to, because they are swimming in uncharted waters without the benefits of the older leadership. In order to do this, we may need to change our concept of teaching, but better now than later." [8]

To be able to independently applying ICT in teaching, it is necessary for teachers to go through basic training and learn about the basic tools. Only after gaining full insight into the possibilities of ICT and the adoption of the necessary skills we can expect a greater degree of communication and connection with students.

III. REVIEW OF ONLINE SEMINAR "TOOLS FOR E-CLASSROOM"

Seminar "Tools for e-classroom" was developed on the Moodle LMS in the period September-October 2010. In accordance with the accreditation of the Ministry of Education of the Republic of Serbia and the Institute for the Advancement of Education RS, the application is active for the past two academic years (2010/11, 2011/2012) and has permission to perform in the next accreditation period (2012/13, 2013/14). Seminar activities take place on the web site: www.azomj.com/moodle.

The target groups of this program are educators, teachers, principals and associates of the educational institutions (kindergartens, primary and secondary schools).

In the period beforehand, the participants were teachers from across the country, a total of 310 participants, organized into ten groups. Implementation of online seminars cover a certain difficulty in Serbia

because this training is new (appeared in 2008) and a large number of teachers do not know how to use the computer and Internet technology. Many teachers are suspicious of this kind of work. Many teachers do not have the will and motivation to use such advanced training. Many have not even heard of these seminars until now and do not know how they work. Little funding are allocated from the MPS for teacher professional development and they have to pay by themselves. So, they rather go where no charge is or where their schools provide training. School principals are suspicious of private organizations dealing with vocational training and prefer to communicate with the state centers for professional development of which there are 10 in Serbia or the local office of Microsoft (Belgrade) that provides free on-line programs under the Partners in Learning program [9].

Despite this, researching results and feedback from the participants indicates that the contents from a seminar were applied in teaching and gave positive effects on students' motivation for learning.

Duration: 6 weeks through the Moodle platform (22 school hours) and live (final meeting-2 school hours).

The idea of the seminar: Should teachers offer students a choice of materials from which to learn, then, in order to fully comply with the principle of individualized teaching and differentiation, in that case you could respect the different learning styles of individuals.

The objectives of the seminar: through the treatment of a variety of software tools, teachers are taught to self use of IC technology and to design their e-classrooms; during the seminar teachers have prepared learning materials in the form of images, mind maps, podcasts, video, multimedia presentations that can offer students in class; to analyze and evaluate the advantages and disadvantages of certain tools for creating teaching materials; to gain insight into the place of new technology in the classroom; to find themselves in the role of students and to identify these classes from that perspective, and not least, to exchange experiences with colleagues from other schools and places.

Topics: Seminar has 10 topics divided into three parts: 1) the theory of e-learning, 2) work with software tools to prepare materials for lessons (Working with digital pictures; Making preparations for the class; Mind maps; Working with PDF documents; Making an podcast and video tutorials; Creating presentations and test for assessment), and 3) tools for communication over the Internet.

Of software tools were analyzed: MS Picture Manager, Word, Internet browser, software by choice to create Mind Maps, programs for reading and creating PDF documents, Audacity, Movie Maker, Power Point, Hot Potatoes or other software to create tests. From web tools for synchronous and asynchronous communication were used: the forum, wiki, chat on Moodle, flash chat, audio / video conferencing (Gmail, Skype, Facebook), instant messaging with Moodle, an e-mail.

Activities: From the participants were expected to choose a topic that will be processed during the seminar; to read/listen/view the set of learning material; to do a

practical task and participate in themes discussions. Within each topic were proposed additional materials for further research that were not obligatory. In the final meeting was made the assessment of knowledge, represented the best work done during the seminar, developed discussion about this works and impressions of the seminar.

IV. RESEARCH RESULTS

Through the seminar was conducted research on motivation for lifelong learning in this way, about access to Internet and e-learning, about stimulating and hindering factors in the process of e-learning. The sample consisted of 303 seminar participants respondents, employed in education (elementary and high school), 258 of which were women (79%) and 65 men (21%). When it comes to their educational level, there are also those with a university degree (75%), and master (13%), college (7%), while the other categories are negligible (specialization-25, magistar-2%, doctoral-1%). On question: Where do you live? respondents answer was: 12% in the countryside, 40% in cities under 70,000 residents and 48% in cities over 70,000 residents. Distribution of respondents by gender, age groups and work place can be seen in Fig. 1 and 2.

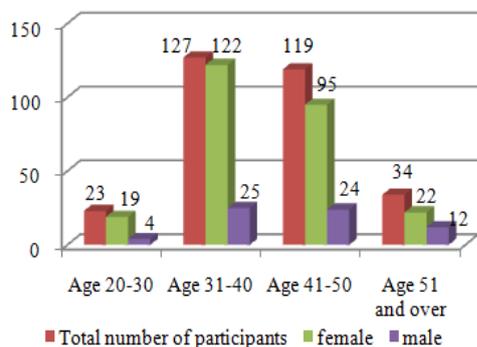


Figure 1: Number of seminar participants by age and gender

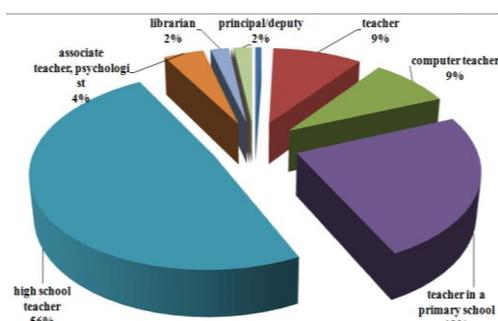


Figure 2: Working position of respondents

The survey was conducted via electronic questionnaire placed on Moodle inside the seminar. Questions were closed multiple choice answers in the form of a one possible answer, multiple possible answer and choice within the Likert scale (completely true for me, partly true for me ...). Opinions are collected via the forum "Evaluation of the seminar" set out in the last topic, in the form of free comments. Analysis of the questionnaire was done in Excel 2007. Opinions were analyzed qualitatively

and here were drawn and presented some of them which was reflecting the prevailing attitude of the respondents.

The full questionnaire had 44 questions. In this paper, we analyze the answers to a few questions.

From where mostly approaches to e-learning? There was possible to choose more than one answer because it is assumed that seminar participants have the opportunity to access the Internet from home and from other places. It has been shown that as much as 96% of participants most frequently accessed e-learning from home, then 29% from work while the other approaches are statistically insignificant. Interestingly, approach to e-learning via mobile phones is not yet reached to a greater extent even though it is known that some people have two cell phones. This may be what is needed to create favorable learning conditions such as peace and quiet and a commitment to content that can be achieved at home, at work less often because there is not enough time for a learning activity and rarely on the street or in motion when mobile devices are used for the quick exchange of information. This result could suggest conclusion that participants approach to e-learning is serious like for traditional learning and demands time and organization of space.

What kinds of Internet connection for e-learning use the most? Respondents could choose more than one possible answer. Participants (total of 303) are mostly used ADSL Internet access (174), followed by cable Internet (86), Wi-Fi (40), dialup (18), via mobile (7) and ISDN (1). Type of connection at the place of living is determined by the existing infrastructure (Table I).

TABLE I. TYPE OF INTERNET CONNECTION

What kinds of Internet connection for e-learning use the most?	(%) countryside	(%) in cities under 70,000 residents	(%) in cities over 70,000 residents
DialUp	14%	3%	6%
ISDN	3%	0%	0%
ADSL	49%	71%	48%
Cable Internet	16%	20%	39%
Wireless Internet	24%	7%	15%
Mobile phone	0%	2%	3%

Cable internet is an offer that is prevalent in major cities which is logical because there is the most developed networks of cable internet. ADSL for the same reason holds primacy in the smaller towns since it is accessed over a telephone line that is now widespread throughout all places in Serbia. Wireless Internet is the most used in the country because it is sometime difficult to achieve connection through cables. DialUp connection to a higher percentage used by those who live in rural areas (14%) than those who live in the city (3% + 6%). The reason might be that in these households still do not felt the need for a continuous connection to the Internet or may not meet technical requirements for connection to other types of connections. Accessed from a mobile phone, the percentage is statistically insignificant but growing trend forward. In this logically leads cities.

What time of day most frequently accessed e-learning? Seems to be there are no rules in the time of day accessing to e-learning. After the response, "When I get there" (M-51%, F-44%) followed by evening (M-25%, F-24%) and night appointments (% M-12, F-20%) for learning when the daily responsibilities subside (Fig. 3). There is a noticeable difference in responses between men and women in the afternoon and night options. It can be explained that women do not have the time to learn the afternoon and work at night because it's so loaded with other works and, unlike men, have the obligation of motherhood, cooking and cleaning in the living space.

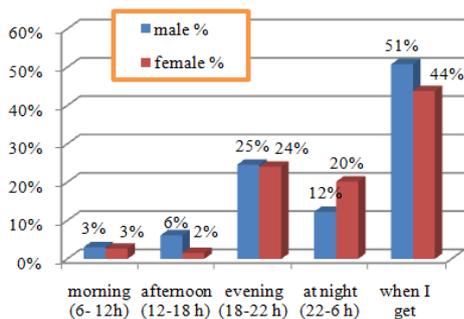


Figure 3: The time of day for e-learning for both gender

Is e-learning compared to traditional learning easier or harder? For subjects under 30 years, it's definitely easier from the traditional. The reasons can be found in the better handling of IC technology and a sense of connection with colleagues and peers that will quickly help in the search for solutions. Older generations feel less that this type of learning is easy and it is natural to be expected given year when they finished their formal education. The oldest, 51 years and over, the hardest aspect of learning (15%), mainly because the first time meet with him and with IC technology. Their schooling and life is generally so far preceded in the traditional way in the classroom, and has already created a certain habit of learning which is more difficult to change in the years to come. The distribution by gender also brings overwhelming response that it is easier to e-learning from the traditional, but it is noticeable difference between the gender, where as many as 7% more males (57%) believe that e-learning is easier than women (50%).

A small number of women (6%) thought that this learning was harder than men (10%) (Fig 4).

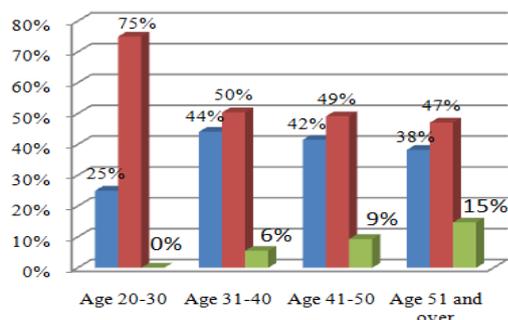


Figure 4: E-learning over traditional learning

Is it more effective than traditional learning?

Despite the fact that the older population (51 and over) declared a high percentage of them that this type of learning is harder, it appeared that they evaluate great the effectiveness of such a way of learning. In their reply is allocated 24% of those who strongly agree with the statement and another 59% of those who considered that the statement "mostly true" for them. It comprised 83% of those who believe that e-learning is more effective than traditional learning. Interestingly, the responses "not for me" and "is not generally" do not exceed 5% of the respondents in any age group, which seems encouraging and creating space for the development of this type of training.

Does knowledge acquired through e-learning is applied in workplace?(Fig. 5)

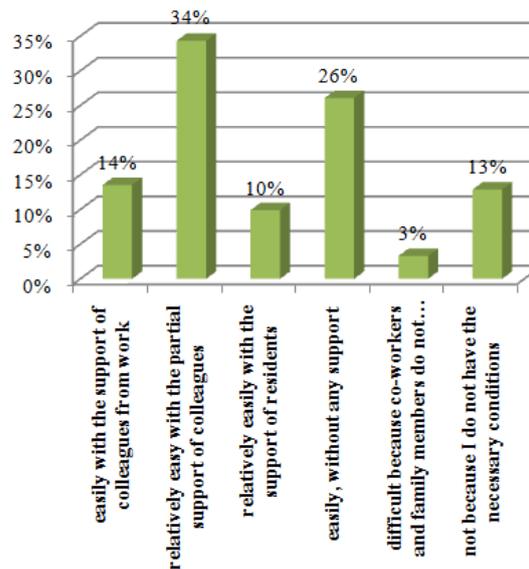


Figure 5: Application of knowledge in the workplace acquired by e-learning

Conclusion of this response might be: "Yes, we apply learned." If we add up all affirmative answers that contain the answer is "easy"-alone or with someone's help, we come to the sum of 84% of the responses versus "hard"-do not have conditions or understanding (of 16%) was a convincing victory. This is really encouraging data. It is interesting to note that there is a willingness to apply lessons learned, but most teachers are not independent of it. Only 26% of respondents self-applied learning, while the other 58% depends on the help of colleagues and family members. This suggests the need for constant work and practice in working with new technologies, the need for adequate technical and physical conditions in the school that would be applied and that knowledge would not be obsolete and the rest of the time while attending a seminar.

V. EVALUATION OF SEMINAR-OPINIONS AND OBSERVATIONS

Evaluation of the seminar was done in several ways: a constant overview of the tasks, following discussion,

getting feedback on the seminar schedule and difficulties during labor, through the questionnaire on the evaluation of the seminar participants at the end of a live interview at the final meeting where the participants expressed their opinion of seminar. Prevailing view that most of the participants were not proficient in the use of IC technology, so it took more time than they expected to work, that they often require the assistance of a friend, a colleague, instructors but they were very happy what they learned, with teaching materials and this type of work. There were also a lot of feedbacks after the seminar about knowledge and materials applied in practice and that the reaction of students was very positive. Five teachers contacted to give thanks and to say that thanks to this kind of work won some national competitions and one international. A large number of participants are sign in for the following seminars of this type, without fear that it will not know how to follow.

Highlights for most typical opinions:

...in my practice I apply e-learning and all that goes with it: Moodle, Edmodo, blogs, MSN, SkyDrive, One Note on the web etc. No matter how much I was familiar with the tools of e-learning, here I improve my knowledge, especially in the e-test-games that simply amaze me and I do not know who enjoys them more: my students or me. The novelty will also now apply in practice-mind maps, which I have not used so far. (Jasmina M, May 2012)

...I think I have ended up with boring seminars that I have ever attended - Live. The outcome of all this for me is 0. This seminar really help me to improve mine " asynchronous communication with students" although I think there is so much more to be learned. (Violeta Dj, April 2012)

...really learn a lot in such a short time. This seminar should attend all of the teachers, because it happens that students know more about tools than teachers. (Snezana K, November 2011)

...this much knowledge of the tools in the e-classroom is essential to every teacher. (Biljana K, October 2011)

...this is the most useful kind of learning that I have experienced after the college. As for relation between the used time and acquired knowledge can not be compared with any form of learning in this country. Although I advocate teaching "live" at all times we did not miss anyone to seek advice. Tools that I met here in 3-4 years will be the alphabet for each educational worker. Thank you very much, and know that you will miss. (Marija J, November 2011)

...although I'm not a beginner, this course was explained to me many things that I have little / no use. (Sonja C, November 2011)

... before the seminar I had minimal knowledge of the computer, but now it's a different story. (Victoria Dj, February 2011)

...I learned a lot and released the fear and aversion of computers. (Jelena P, January 2011)

...and created a habit in due time reading forums, searching the set materials, lessons etc. Sometimes I

doubted myself and my capabilities, but I swam and learned a lot. (Sanja EB, January 2011)

...with the times and modern educational needs. (Aleksandra B, January 2011)

...demanding, requires a lot of time, maximum of concentration but we get the beautiful directions for further work and learn a lot. (Ljiljana S, January 2011)

... I have born a thousand ideas about where and how I will be able to apply this knowledge; already talking about that with colleagues, students, even with the family ... (Mirjana B, December 2010)

...e-learning is no longer the future, with this seminar has become a reality. (Vladan P, December 2010)

... during the past month, I began to experiment and ... I give assignments to students that they do not expect, and it is directly or indirectly related to my subject, English. Children respond very positively, because I made a step towards overcoming the gap between generations. (Dragana B V, November 2010)

...seminar has reached the effect. A small demonstration here - after teachers counseling in the IT room a dozen colleagues not to rush home but already talking about the tasks of the seminar. (Zorica P, November 2010)

...atmosphere in the participants of the seminar is colored by work and exchange of tasks; people who may have worked for several years and are not exchanged even 10 sentences now are communicating. This contribution is immeasurable. I have so much advanced, so it is a miracle for me too. Salute for all digital immigrants in the sixth decade. (Svetlana O, November 2010)

...from the beginning I liked to be able to learn when I can do it, regardless of the time of other participants. There has been useful information on the responses of other participants, from the communication between them. (Vesna K, November 2010)

VI. CONCLUSION

Experience with seminars and results of the research shows that there is a need and willingness to develop this type of learning further more. Individual time management, cost savings and more efficient way of learning over the Internet are often emphasize as benefits from online seminar participants.

The research confirmed the expectation that with the young population to 30 years, this type of learning has been recognized as easier than traditional, while other age groups generally recognized as easier or equal by difficulty.

The seminar has achieved great thrill and motivation with those teachers who were attending, regardless at their previous of ICT skills and knowledge. The percentage of drop-out rate was extremely low, less than 3%. To acquiring new knowledge and complement the old was serious comprehended by all participants, regardless of their profession. Positive attitude about the use of new ICTs in teaching prevailed, in all categories of

respondents. It is encouraging that the teachers are willing to share their knowledge gained in this way with colleagues and students.

By improving the infrastructure and equipment that will allow faster access to the Internet, you will see a countless of opportunities for e-learning. Formal education is slow to change and adapt to the requirements of time so that initiate the emergence of informal education. E-learning is still more present in the non-formal education, but e-learning is our present and our future.

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Availability of Business Intelligence Tools on the Macedonian Software Market

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Abstract - Implementation of the concept of business intelligence is conditioned by the need of companies for access to the necessary information on which basis would be brought quality decisions. Current estimates are that a typical company analyzes only 10% of the collected data. By applying the concept of business intelligence every company can use the remaining data collected from various sources and turning them into high-quality information. Business intelligence allows companies the opportunity for timely perceiving problems, so companies can focus on eliminating the causes than the consequences of a problem solving. The need of implementation of business intelligence system also imposes the stronger competition, developed channels of distribution, and supply of products and services that significantly exceed demand. In the R. Macedonia there are no relevant data about the statement of the software market and also for the business intelligence market. This study should give some initial information especially about the some issues: supply of software for business intelligence on the Macedonian market, Macedonian companies partnership with leading global software vendors, the movement of prices on certain software tools, what are the trends in the market of business intelligence within the overall software market in Macedonia etc.

I. BUSINESS INTELLIGENCE

The main feature of today's business is continuously generating large amounts of internal and external data and information. The application of the concept of business intelligence [1] enables companies to use only the information who in a certain period of time they need, for making business decisions, and presented in a way that best suits the end users. At the same time, if business intelligence is applied in the right way [2], it reduces the amount of data and information at the same time with increasing their quality. Therefore, the main purpose of implementation of the concept of business intelligence is generating better information they need to companies for making quality business decisions. With that companies who implement this concept are given the power to encourage and create positive changes in their environment.

In the literature review there are a number of definitions of the term business intelligence, but all definitions can be said that refer to the following: Business intelligence is the process of collecting the available internal and relevant external data and turning them into useful information that help users in decision making [1].

In complex business systems awareness of the usefulness of business intelligence is growing day by day, and thus the need for the implementation and use of such information systems, especially for the introduction of business intelligence tools, with which it would be possible to implement this concept in practice. Business intelligence tools enables to business users easier review and analysis of vast amounts of complex data.

One of the basic characteristic of business intelligence is that it arises from operational data, business intelligence is proactive and oriented to supplying information that is intended to individuals. Important prerequisite for the implementation of the concept of business intelligence is that users express their preferences, depending on the type of information they want to receive, the frequency of information and resources of communication that users through which will receive this information.

In the R. Macedonia there are no relevant data about the current trends of the business intelligence market. The purpose of this research is to obtain relevant information about the current trend on the Macedonian business intelligence market as: the size of that market, which companies participate on business intelligence market, whether the world famous software manufacturers are present on the Macedonian business intelligence market, the movement of prices on certain software tools etc. The subject of the research in this paper is Macedonian business intelligence market, and through him, the state of the overall software market.

The survey covered 21 largest software companies in Macedonia, and the companies are surveyed by using the on-line questionnaire. Due to limited size of this paper will be given an analysis of those questions that are of particular importance for research.

II. ANALYSIS OF RESULTS

From the results as shown in Fig. 1, the most of the surveyed companies or 57,14%, develop own software solutions and that software companies becomes competitive in the global software market with its innovative solution. Also, that fact suggest that in R. Macedonia can find software solutions that are adapted to Macedonian economy and way of working, and according to price who match the financial capabilities of Macedonian companies.

On the other hand is a very small number of software companies that only sell software tools, especially small

number of companies that have established partnerships with some of the world's software vendors. This condition will be illustrated in further analysis. It would mean that if a Macedonian company would like to buy the software tools that will incorporate in their business operations will have to do it either from the manufacturer of software or by someone his partner in the neighboring countries.

Also we have companies that not only develop custom software solutions but they sold software solutions from other software manufacturer, most often products of Microsoft.

Only 38%, as shown on Fig. 2, of Macedonian software companies offer software for business intelligence, which means that business intelligence is a relatively new concept in the Macedonian market. But this percent represents a satisfactory level for Macedonian condition, because Macedonian software market is steel not enough developed. Also the concept of business intelligence is a relatively new concept for Macedonian companies who operating in the business sector. Maybe soon, when business intelligence will become a practice for Macedonian companies will increase interest of Macedonian software companies to develop more business intelligence tools, and will increase the presence of world software vendors on the Macedonian software market.

On the other hand, when we make comparison with the previous question, all 38% of companies that sell software for business intelligence, they develop their own software solutions for business intelligence.

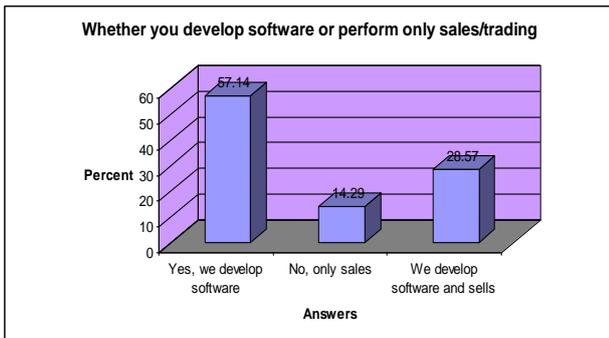


Figure 1. Whether you develop software or perform only sales/trading

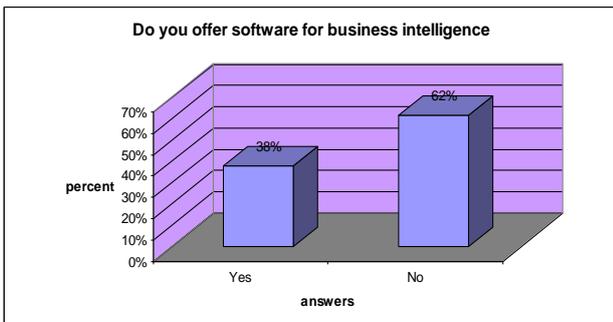


Figure 2. Do you offer software for business intelligence

The companies who develop your own solution for business intelligence most of them have partnership with Microsoft. Also, from the obtained results can be seen that a large part of Macedonian software companies have

established no partnership with any world software vendors, while those who have some kind of partnership most of them have done with Microsoft. From the Fig. 3 can be seen that even 55% of companies have a partnership with Microsoft and if we add those 35% who have no partnership with any world software vendors, then only 10% of Macedonian software companies have partnership with some of the other world software vendors. Can be said that Microsoft is the undisputed on Macedonian software market in terms of availability of software tools. This indicate that still on the Macedonian software market, especially on the business intelligence market has no sufficient availability of business intelligence tools.

Of the other world producers of software solutions, especially in the field of business intelligence on Macedonian software market are present only the software applications of IBM and SPSS whose official representative in Republic Macedonia is a software company Gord Systems. Therefore on Macedonian software market availability of tools for business intelligence is very low, unlike of other countries in the region where already are present the largest world producers of software solutions in the field of business intelligence. The availability of custom software solutions of Macedonian software companies combined with business intelligence tools of world producers of business intelligence tools greatly will increase competitiveness on Macedonian software market.

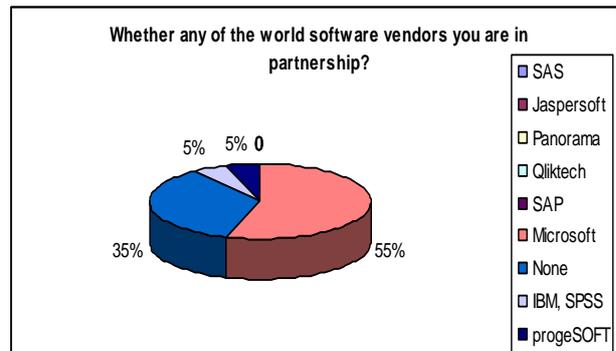


Figure 3. Whether any of the world software vendors you are in partnership

In the Table 1 are given business intelligence tools that offer Macedonian software companies who are covered in the sample. The answers are given originally like answer in the survey.

In the Table 1 are given the biggest software companies that sell software for business intelligence. Here are presented those companies that fully answered the question to indicate the software tools that they sell. It is characteristic that the majority of companies while developing custom software solutions offer and sells most of the Microsoft products.

TABLE I. BUSINESS INTELLIGENCE TOOLS

Company	Business intelligence tools
Sigma SB	MS SQL analytics, MS Dynamics, NAV Business Analytics
Gord systems	IBM/SPSS Predictive Analytics products: PASW Statistics (SPSS Base, ...) PASW Modeler Pro (Clementine) Jasper report
Object x	OX Enterprise Solution Business Process modeler (<i>custom software solutions</i>)
Digit computer engineering	ERP software Business expert (<i>custom software solutions</i>)
Asseco	Microsoft, IBM, Oracle
Seavus	Microsoft solution and open source solutions, own business intelligence tools and software for Telecommunication companies
Entire logic	MOSS MS SQL MS SQL AS
Re-aktiv	Microsoft products
Neon systems	POS software (<i>custom software solutions</i>)
Point plus	Different software for: ERP Finance Distribution Retail (<i>custom software solutions</i>)
Edusoft	Custom software solution in many areas, software by order from clients
BMG universe	Custom software solution in many areas, software by order from clients

Software companies that produce custom software solutions creates such software applications most often by order of customer for specific needs of their business. A large part of these software companies usually do not offer ready-made software solutions that would be found in a free sales on Macedonian software market, but solutions for specific clients.

Cost of software tools who are offering on Macedonian software market usually varies from 1.000-10.000 Euros as shown on Figure 4. Most of the companies that develop software, they sells software within 1.000-10.000 Euros which borders is a reasonable price for Macedonian business entities. The group of companies that sell software over 100.000 Euros are those companies that sell software for business intelligence.

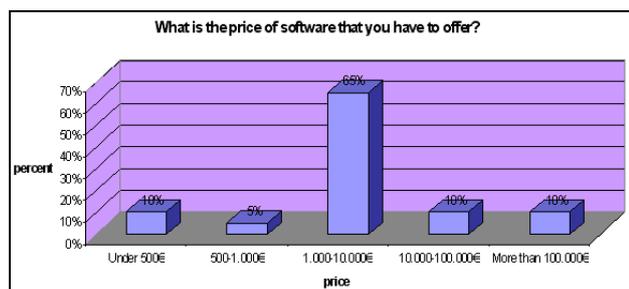


Figure 4. What is the price of software that you have to offer

These data suggest that today's not only large companies, even small and medium-sized companies can afford these software solutions whether it is a business intelligence tools or any other tools. A few years ago business intelligence tools could afford only large companies, but today the price of 1.000-10.000 Euros means that any company that is oriented towards new advanced techniques can implement concept of business intelligence.

Thereby most of the software tools that are offered for a price of 1.000-10.000 Euros are software tools that have been developed by companies that sell them.

This cost of software tools suggests that Macedonian companies that develop custom software solutions tend to adapt to the conditions of Macedonian economy. The reason for this is that, in R. Macedonia are mostly small and medium-sized companies so they do not have large financial ability to invest in new advanced information technologies. In the frame of their budgets price of 1.000-10.000 Euros is the price that can afford small and medium-sized enterprise.

Simple fact that business intelligence tools offer the possibility to convert the huge amounts of data into useful information suggests that the benefits of their use would be far greater than the costs that would be made to implement the business intelligence system.

According to the survey data, software companies in the Republic of Macedonia during the past year sold an average 20 software tools. This data refers to the total number of software companies that participated on the Macedonian software market and who are covered by survey. On the other hand when we take only those software companies that sell software for business intelligence, then the number of software tools sold in the last year has averaged 10. This means that the average number of sold tools for business intelligence is twice lower than the average that applies to the entire software market in the Republic of Macedonia. Cost of the most of business intelligence tools that are sold over the past year is within the average price that was previously mentioned within 1000-10000 Euros. It would mean that the cost is not the limiting factor for lower sales of business intelligence tools compared to the overall average on sold software tools on Macedonian software market. It is the price that could afford each business entity that intends to be competitive in the market. The reasons for the lower sales of business intelligence tools in terms of sales of other types of software can be varied. Starting from the low availability of business intelligence tools on the Macedonian software market, until uninformed Macedonian companies about the benefits offered by the introduction of the concept of business intelligence.

In terms of information of Macedonian companies when buying business intelligence software very characteristic, as can be seen from the Figure 5, that no company is excellent informed about the availability of tools for business intelligence.

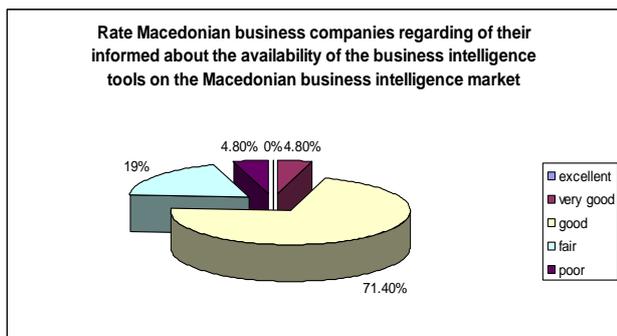


Figure 5. Rate Macedonian business companies regarding of their informed about the availability of the business intelligence tools on the Macedonian business intelligence market

Fig 5. shows that most of the companies or 71.4% are partially informed which suggesting slowly acceptance of new information technologies by businesses. Maybe slowly acceptance of all novelty is the biggest problem for Macedonian companies for implementing concept of business intelligence. On the other hand the lack of promotion of its products by the software companies can be another cause of this condition. Organizing workshops and seminars by software companies for the benefits of their software tools would contribute to the introduction of Macedonian enterprises with the availability of software solutions in the field of business intelligence.

Reasons for this condition require a deeper analysis and research that will answer these questions.

When it comes to recognizing the need for a software most of the Macedonian companies do not know exactly and precisely what software they need to support their business processes. From the Fig. 6 can be seen that even 57% of software companies in Macedonia, said that when comes particular customer, he has no specifically defined what software is needed.

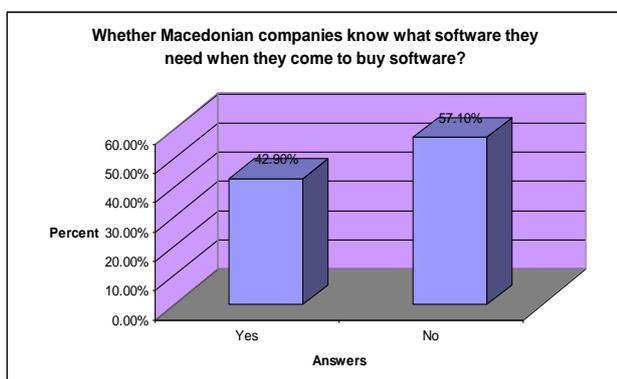


Figure 6. Whether Macedonian companies know what software they need when they come to buy software

A large part of the Macedonian companies, building the appropriate information infrastructure is not considered as a competitive advantage. Because of that Macedonian businesses often do not know their information needs. But in today turbulent operating environment when information becomes the most important resource, any company has need of a modern

information system. Within such information system in each company would be incorporated business intelligence system, as its integral part.

III. CONCLUSION

Although at first sight, may gain the impression that the application of business intelligence systems intend to create larger amounts of data, the reality is actually the opposite, because this concept is based on generating better and qualitative information, which is required for management, for improve decision making process.

The results obtained by the research point to the fact that software tools for business intelligence are not yet enough available on the Macedonian software market. In addition, the majority of business intelligence software that are available on the Macedonian software market is developed by software companies that sell it. On the other hand, very small number of world software vendors are present on Macedonian software market, that perhaps brings little competition in this area.

However there are, also, positive trends in the Macedonian market for business intelligence software. This positive trends are related with companies that are directed towards the development of their custom software solutions. On the Macedonian software market already we have a few mature companies that can cope with international trends and equally to compete in the global software market. It is seen as the software that they sell, the number of sold software tools and their price.

Also the price at which are offer software tools on Macedonian software market is within the limits acceptable for financial capabilities for Macedonian businesses. This would mean that not only big companies but also small and medium-sized companies can afford the implementation of an appropriate information system and within that system, business intelligence system.

However, Macedonian market for business intelligence software is market developing, so in the next period can be expected to improve today's market trends.

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Our Kids And Cyber Crime

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Abstract - Information security, which is one of the new directions of research in the field of security, it has emerged as a result of the emergence and development of the information society. Information security is seen as one of the main components of national security doctrines in some countries. All information has a very important role, which requires protection and supervision over communication systems that serve as a means of conveying information. In terms of security, unsupervised flow of and access to information can cause numerous undesirable consequences for individuals, companies or a society as a whole. This paper aims at portraying the level of awareness children have regarding potential threats, as well as their experience in cybercrime, and it also touches on the subject on how to react in a given situation to a potential threat in cyberspace.

I. INTRODUCTION

Access to public information is mandatory, but its implementation has not been determined by the decisions of individual corporations/ individuals/companies that do not provide access to records regarding their personal life. They provide electronic supervision in the form of data protection and information. This primarily applies to encrypting data / information, but also other measures are taken in order to hide certain data/information from the public eye.

There are data/information that also require supervision, which therefore can fall into the category of supervised or secure information. Secure information is of vital importance to an individual, group or organization; they are electronically protected in advance and in order to gain access to them, one has to “break into” the electronic data protection control.

Modern information systems are increasingly connected to the "optional" network. Non mandatory or optional networks are, like the Internet, which do not include formal (legislative), organizational or even technological interdependence. In such a network two major trends take place at the same time. The first is that individuals and organizations become critically dependent on the system, and the second refers to the vulnerability of (network) systems, which rapidly increases because more and more potential attacker have access to the network and other systems. [1]

II. MISUSES OF COMPUTERS AND THE INTERNET

With the advancement of new technologies and the Internet, communication has never been more widespread,

cheaper, faster and more accessible. People share millions of messages, but the words and messages have never had less meaning or "weight." Although in today's world merely containing information is considered to be an extraordinary advantage, however, messages that carry the same information are often essentially completely worthless for the recipient. The global Internet, in addition to providing easy and quick flow of information can also be seen as a source of exploitation and a challenge for the legal system. Thus, it is via the Internet that some of the greatest violations of human rights and dignity occur.

Ordinary crime includes offenses that are considered harmful for all social systems at all times. These are offenses which attack the status of social values in the material and moral sense. A Computer Crime is a criminal act in which a computer, a computer system or a network appears as an object of the offense criminal activity is carried out on it), or as the subject of a criminal offense (an execution, planning or concealment of fraud and obstruction of the investigation).

III. INTERNET CRIME REPORT FOR 2008. (INTERNET CRIME COMPLAINT CENTER (IC3))

The ten countries with the largest number of reported perpetrators via the Internet:

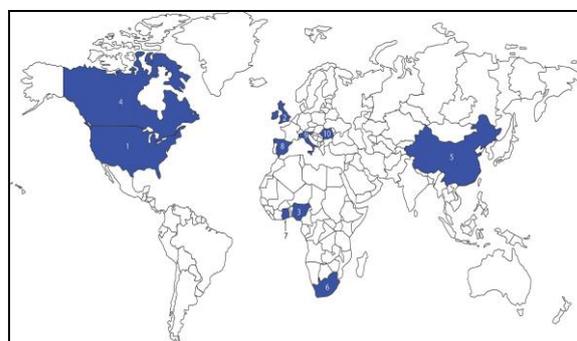


Figure 1. The ten countries with the largest number of reported perpetrators charged with crime on the Internet in 2008 (source:www.ic3.gov/media/annualreport/2008_IC3Report.pdf)

1st	United States	66.1%
2nd	United Kingdom	10.5%
3rd	Nigeria	7.5%
4th	Canada	3.1%
5th	China	1.6%
6th	South Africa	0.7%
7th	Ghana	0.6%
8th	Spain	0.6%
9th	Italy	0.5%
10th	Romania	0.5%

The residence of the perpetrators has been identified in the United Kingdom, Nigeria, Canada, Romania and Italy, although borders are not of great importance for computer crime. The people in charge may increase the effect by creating a link to other countries, refusing to accept the loss of money, and rather tracking it down.

Internet crime is on the rise, which is evident from the number of reported fraud:

TABLE I. INTERNET CRIME - FRAUD REPORTED PER YEAR

Year	The number of reported frauds:
2008	275.284
2007	206.884
2006	207.492
2005	231.493

These numbers of reported complaints have included various types of fraud. Research shows that only one in seven incidents or fraud was reported to regulatory agencies.

The ten countries that have the largest number of individual fraud are:



Figure 2. The ten countries that had the largest number of individual fraud via the Internet in 2008 are: (source: www.ic3.gov/media/annualreport/2008_IC3Report.pdf)

- 1st United States 92.93%
- 2nd Canada 1.77%
- 3rd United Kingdom 0.95%
- 4th Australia 0.57%
- 5th India 0.36%
- 6th France 0.15%
- 7th South Africa 0.15%
- 8th Mexico 0.14%
- 9th Denmark 0.13%
- 10th Philippines 0.13%

TABLE II. DEPENDENCE OF THE DEMOGRAPHICS OF THE VICTIMS OF FRAUD, AND THE AVERAGE LOSS IN 2008

Demographics of applicants who reported fraud	Average loss per fraud	
	2008.year	2007.year
Men	\$ 993.76	\$ 765.00
Women	\$ 860.98	\$ 552.00
Under 20 years old	\$ 500.00	\$ 384.99
20-29 years old	\$ 873.58	\$ 610.00
30-39 years old	\$ 900.00	\$ 699.99
40-49 years old	\$ 1,010.23	\$ 760.00
50-59 years old	\$ 1,000.00	\$ 750.40
over 60 years old	\$ 1,000.00	\$ 760.00

From the data in the table we can conclude that men have reported significantly higher loss than women (women reported \$1, while men reported \$ 1.69). As for

the age group, people between the ages of 40-49 reported the highest losses.

From the annual reports of the average amount of money lost due to fraud, we can see that the amount of money lost was significantly lower in 2007 when compared to 2008. The percentage ranges from 30% - 50% depending on the category of the applicants. This data also tells us that Internet crime is increasing from year to year and adequate measures should be taken in order to make people more aware and less susceptible to exploitation.

IV. OVERVIEW OF METHODOLOGY RESEARCH

The objective of the research is to determine the number of children in elementary and middle school that are familiar with computers, Internet communication, and whether they are aware of the potential dangers in cyberspace.

The goal of the research is set out in three stages:

1. Determine the number of children that are familiar with computers, Internet communications, and potential threats in cyberspace.
2. How children experience cyber crime.
3. In what ways they respond to cyber threats in a given situation.

In accordance with a defined scope and objective of the research the main research hypotheses is:

- School-aged children are not familiar with cyber crime.

The research was conducted through a survey. A precondition to fill out the questionnaire was to affirmatively answer the question: Do they use a computer and the Internet?

The sample of respondents consists of sixty students from the municipality of Kula. Out of sixty respondents, 24 were boys and 38 girls, who all filled out a questionnaire.

Information on the respondents and their personal characteristics include examining the data that we considered most relevant for the research, which relate to the following four variables: age, sex, class, whether they attend a vocational school or a regular high school.

V. RESEARCH RESULTS

TABLE III. RESPONDENTS AGE AND SCHOOL THEY ATTEND

Age of respondents (years)	Frequency	Percentage
to 15	27	45
over 15	33	55
Total:	60	100

In this way it was determined that 45% of respondents attended a primary school, and 55% attend a secondary school. There were 11 students who attend a four-year vocational high school, 9 of them attend a 3-year

vocational school, and 13 students attend a regular high school.

TABLE IV. DO YOU ATTEND COMPUTER SCIENCE CLASSES?

They are taking classes in computer science	Frequency	Percentage
yes	48	80
no	12	20
Total:	60	100

The answer to this question is "no," which was given by a few elementary school pupils. The result intrigued us, so we tried to find an answer as to why it is that not every student attends classes in computer science.

We came to realize that the computer science class is an elective course at the elementary school and that it is up to the school administration whether this class will be on the elective subjects' list. However, once this class is chosen by the students in the fifth grade, they must attend that same class until the end of their primary education.

Whether computer classes will be offered to students or not depends on the school staff and the number of class hours. We view this as a major flaw in the curriculum of primary education because all these children use a computer at home, which had previously been established. Another very important fact is that children who have no basis in the field of Informatics get to equally start high school with children who did attend computer classes in elementary school.

TABLE V. ARE YOU A MEMBER OF A SOCIAL NETWORK ON THE INTERNET, SUCH AS FACEBOOK; AND IF SO, HOW OFTEN DO YOU ACCESS THE NETWORK?

Are you a member of a social network on the Internet	Frequency	Percentage
yes	56	93.33
no	4	6.67
Total:	60	100

All 56 respondents who responded affirmatively to this question indicated that they visit the network at least once a day. This means that all of them actively communicate with other people via computers and the Internet. When asked if they accept strangers as friends on the social network, 90% of respondents answered affirmatively. Taking into account the fact that in these networks a lot of people put on a false profile, we can conclude that all these children unknowingly and unintentionally expose themselves to great risk. Perhaps these unknown so-called "friends" might be pedophiles, or might be engaged in human trafficking, and perhaps even drug dealers who in this way find potential buyers for drugs and make a profit from it. Children see no more than a page of social networking, socializing, having fun, and most of them do not think about the potential dangers of using such networks.

TABLE VI. HAVE YOU TALKED ABOUT CYBERCRIME IN YOUR COMPUTER SCIENCE CLASS?

Duo you talk about cybercrime in your computer science class?	Frequency	Percentage
no	48	100
Total:	48	100

This is worrying; 48 children who responded positively to the question whether they attend computer classes, said that they have not covered the topic of cybercrime in class. The results show that children who do attend computer classes have not been told about cyber threats online. How spontaneously and sincerely will they engage in communication via the internet depend on their aptness and mental stability? This is also a great responsibility for parents who are left to educate children on their own. However, there is another problem; parents might also have very little or no information on this subject and therefore cannot protect or help their children in this matter.

TABLE VII. HACKERS ARE...

Hackers are...	Frequency	Percentage
The correct answer	42	70
No correct answer	18	30
Total:	60	100

TABLE VIII. DO YOU APPROVE OF THEIR ACTIONS, AND IF SO WHY?

Do you approve of their actions	Frequency	Percentage
yes	24	40
no	36	60
Total:	60	100

The table shows that seventy percent of respondents know who hackers are, and forty percent approve their actions. When they are asked why they approve such deeds, most of them answered that they are capable and smart people;

The following response was that they love the challenge, and the third was that they know how to do something that most people do not know, and they put their knowledge to use.

These answers are disturbing, because they see hackers as idols and people who should be admired rather than as criminals who are supposed to be punished for their activities.

TABLE IX. DO YOU ACCEPT MESSAGES ON THE INTERNET THAT YOU DO NOT KNOW WHAT THEY MEAN (FOREIGN LANGUAGES OR UNFAMILIAR WORDS)

Do you accept message on the Internet that you do not know what they mean	Frequency	Percentage
yes	32	33.67
no	28	66.33
Total:	60	100

When asked if they accept message which they do not understand, two-thirds of the respondents answered

negatively, which is not as worrying of a response as some of the above. This is the easiest way to accept various types of viruses that act differently and have different goals of existence.

TABLE X. COULD YOU BE A VICTIM OF CYBER CRIME

Could you be a victim of cyber crime	Frequency	Percentage
yes	14	23.33
no	46	76.67
Total:	60	100

The result of this answer shows how self-confident the youth is and how convinced they are that bad things cannot happen to them; 76.67 percent of the respondents believe that they may never fall victims of cybercrime. Furthermore, such people are the easiest to deceive because of their self-confidence; they are less cautious. Additionally, every absence of caution only makes the job easier for computer offenders to make a move.

VI. CONCLUSION

The research conducted has proven that school-aged children are not aware of cybercrime. This leads to the conclusion that we should start working on changing this situation, because they are the small, honest children, who are the easiest target for delinquents. Great attention needs to be paid to this problem, especially in schools, due to the fact that we cannot wait and sit around until the child comes to us and asks questions about this matter; we should pique his/ her interest regarding this topic at an early age, at school.

Vivid methods should be implemented to raise awareness of the dangers lurking in cyberspace. Also, not only children but people of all ages should be informed about these threats. Electronic media is the best way to accomplish such a goal. People should be aware about the dangers of what they may come across while using electronic communication devices. The lack of precaution makes the perpetrators' criminal acts easier. That is why people of all ages should be familiar with the cons of the internet, and should also be trained to avoid any kind of dangers.

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Structure and Development of Referee's Board: Client and Server Edition Solutions

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Abstract - Referee's Board: Client solution has been developed in order to form a tool, through which, basketball action are drawn in a very natural way. Based on basketball action drawings, within the client, through specific methods, a trajectory of a basketball ball during basketball action is formed. Basketball action consists of a number of phases. Given the limitations of neural networks, for now, it is possible for some basketball action with a maximum length of 15 phases, or 15 key points, as it is shown in paper [10], to determine the optimal path of the basketball referee to best comprehend the given action. Client representation Referee's Board is an upgrade of the application that was previously developed in Borland C++ Builder 6, while the server components written in C# in Visual Studio 2010 development environment.

I. INTRODUCTION

The decision to, upgrade already existing solution with the goal of integration into existing, lies in the fact that both solutions cover a similar topic from different viewing points. It is considered that the existing solution already has a quality engine to draw actions, using a simple, drag and drop method, and simulate basketball action on the ground, with a pixel collision / detection system. This system was later used to calculate the coverage of a basketball action, in relation to a visual field of a basketball referee, and the elements that are found in his visual field.

Bearing in mind that all previous mechanisms, in terms of training the neural network [4][7] calculations and which is intended to form ideal pathways of referees, are formed in .NET environment, specifically Microsoft Visual Studio 2010 [3][1], it was necessary to find a way to connect the existing solutions, in order to exchange data between themselves.

Since Borland [9] and Microsoft follow different conventions in terms protocol formulation, binary serialization and component development, it was decided that the communication between these two solutions is to be implemented using TCP / IP sockets [2], which would exchange Unicode String commands that follow a particular convention. For now, there are only three commands that meet all current requirements of the developed system.

Those commands are

- connect
- calculate
- request

Connect command has the following structure `"/command / connect / {username}"`. Parameter {username} is a user name and primary identifier. through which the user's Referee Board: Client logs in to the Referee's Board: Server Edition server application. Typically, this is the name the computer, if the client does not specify a different user name. When the Referee's Board: Server Edition program receives command of the Referee's Board: Client a client is registered and its IP address is placed in the list of currently active clients, along with its identifier. Relationships with these clients are constantly maintained, in particular background threads. The client is always informed about successful or unsuccessful connection.

Calculate command has the following structure `"/command / calculate / {req / com} | {username} | {IP Address} | {Input Vector} | { Output Vector}"`. Parameter {req / com} indicates which mode of command. If the value of a first parameter in a Calculate command is set to req (request), it means that the neural network should, for this request, form an ideal trajectory for basketball referees. The same kind of command with an ideal path of basketball referees, server sends to the client, with slight modification, that as the first parameter, instead of req, is com is set (computed). This way the server emphasizes to the client that it has successfully determined the optimal referee path for ball path data that the client sent to him. If the server returns the req command prefix in the first place, the client indicates that their previous request was invalid.

Request is not valid if the input vector impairs the form of neural network, meaning that it contains more than 15 key points (30 elements) or a zero-length array of points, that is if the elements of the input vector are not in the appropriate range.

Input parameters {Vector} and { Output Vector } are input and output vectors of a neural network [5][6]. For

input vector that has been sent, a corresponding output vector is formed, which together form the response to the request sent by the client. received response is further parsed and based on the optimal path of basketball referees is formed on the client side.

Request command form is very similar to calculate command form. Compared to calculate command, they only differ by keyword which indicates, what type of command it is, and the first parameter can only have value the value of req. The structure or request command is as following `"/ command / request / req | {username} | {IP Address} | {Input Vector} | { Output Vector }"`. Request command server receives from the client, and records the provided data which could be further analyzed in order to determine if neural network should be additionally (re)trained.

II. REFEREE'S BOARD : SERVER EDITION - APPEARANCE AND USAGE

Primary goal of Referee's Board : Server Edition is to host a neural network that will calculate optimal paths for referees movement in a client - server environment. As it is shown on figure number 1, it be concluded that the interface's Referee Board: Server Edition program consists of three parts:

- Main Menu
- Referee's Board Log section (in real time)
- Server section

Server section includes a button that starts or stops the Referee's Board: Server Edition program. When the specified server starts, it is ready to exchange data via port 1986 with the Referee's Board client. Server can have an unlimited number of connections, however, the current recommendation is that the number of active clients served by one server is limited at 30 connections.

Referee's Board Log section tracks events of:

- client establishing or a connection to a server
- client leaving from the server
- complete exchange of data between servers and clients.

Settings form, shown on figure 2, that is available via Options menu, has methods that allow you to configure:

- The directory where log files are stored
- Log file Form appointment
- The directory in which the requirements are kept
- Form with file naming requirements
- The directory in which to keep the neural network
- The directory in which to keep the basketball actions
- The directory in which to keep basketball action animations

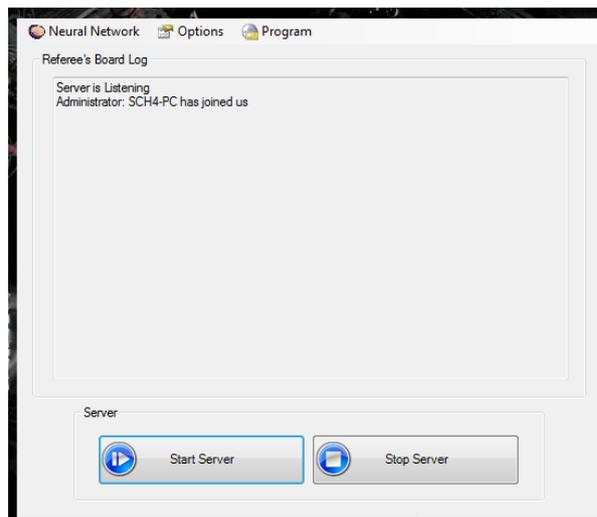


Figure 1. Referee's Board : Server Edition - Main Form

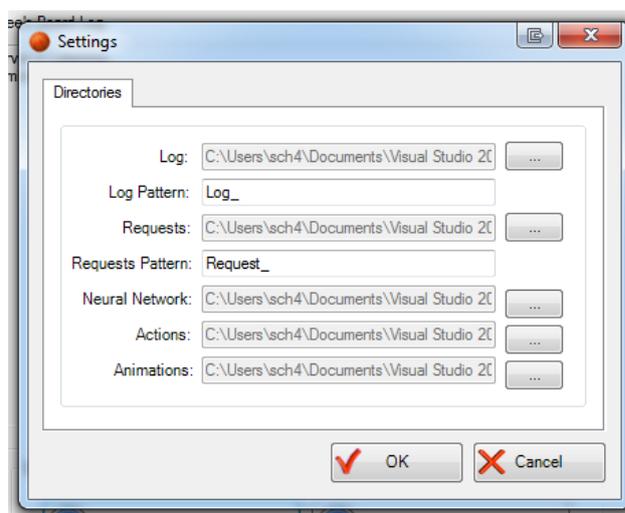


Figure 2. Settings form of a Referee's Board : Server Edition solution

III. REFEREE'S BOARD : CLIENT - APPEARANCE AND USAGE

Primary goal of Referee's Board : Client application is to, in a very natural way draw basketball actions, and to determine, for both drawn, and ideally generated paths of basketball referees, if a basketball referee, who was following that exact path could clearly see some part of an action that had a referees, probably his own, ruling. As it is shown on figure number 3, it be concluded that the interface's Referee Board: Client program consists of three parts:

- Main Menu
- Toolbar
- Space that shows the currently active diagram

Main Menu has various options which contribute to the developed solutions functionality. Starting from the basic options, that are used to create, save or open new diagrams in multi document mode, through Options menu which contains options that are used to configure diagram

space, as well as export flash animations of basketball actions, play video files, or configure parameters that are needed to connect to a Referee's Board Server Edition, one of the most visually important options, that are used when calculating percent of referee's action coverage, are grouped in the Display submenu.



Figure 3. Referee's Board : Client Edition - Main Form

Options from Display menu draw out the official FIBA quadrant layout that is used for basketball statistics and ruling in case of an action. Based on the positions of quadrants and sub quadrants, and assignment of juristic ion over quadrants, referee's vision coverage is calculated based on a pixel collision methods and human field of vision rules. Figure 4 shows the current positions of quadrants [9]. Each quadrant has four sub quadrants.

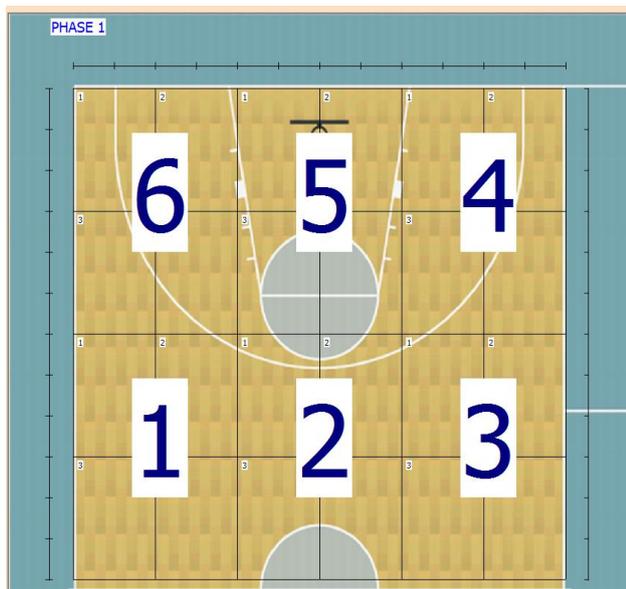


Figure 4. Basketball court quadrants and subquadrants

Toolbox can be found in three phases. Layout toolbar in Phase 1 is shown in figure number 39 The transition from phase to phase is in strong correlation with the interaction between Referee's Board: Client program and the Referee's Board: Server Edition program.

The first six tools, are available at each stage. Their function is, from left to right:

- Create a new action
- Open an existing action

- Save the current action
- Show Report
- Change court
- Show the official FIBA rules

The seventh tool is a tool to connect the Board's Referee: Referee program with Client's Board: Server Edition program, based on the previously configured parameters. After connecting to the server, the tool changes the icon and gets the role of a tool that breaks the connection with the Referee's Board: Server Edition program.



Figure 5. First phase of a Referee's Board : Client Toolbox

Figure 6, shows the appearance of Toolbar, when the Toolbox is in the phase number 2 after the Referee's Board : Client program has successfully realized the connection with Referee's Board: Server Edition program. As noted above, after connection has been successfully established with Referee's Board: Server Edition software tool to establish a connection becomes a tool to break the connection with a server. In addition to these tools a tool appears (represented by an icon on which is a drawing of the brain) that, based on the plotted action, passes data on the movement of the ball via established connection with the Referee's Board: Server Edition program, and from the same, gets data on the optimal movement of basketball referee and uses this information to establish the pathways of the referees on previously drawn diagrams.



Figure 6. Second phase of a Referee's Board : Client Toolbox

After successful communication with the Referee's Board : Server Edition software and by drawing optimal movement paths for basketball referees, two additional tools appear. The first tool (represented by an icon on which an eye is drawn) determines and displays percentages of some action coverage from all of the referee's view points. Figure 7 shows the appearance of a Referee's Board : Client toolbox in third (final) phase.



Figure 7. Third phase of a Referee's Board : Client Toolbox

The last tool in a row (represented by a warning icon) sends a report to a Referee's Board: Server Edition program that the user is not satisfied with the paths of basketball referees that a neural network of a Referee Board: Server Edition program proposed as the optimal path. See figure number 7.

Figure 8 shows an example of one phase of basketball action that can be drawn using these tools.

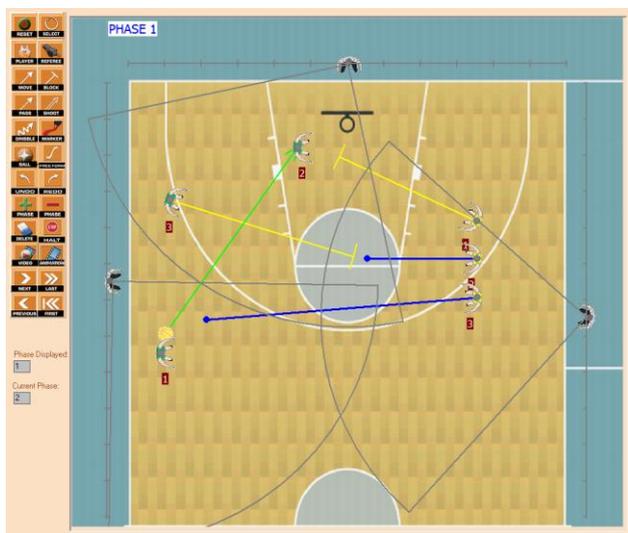


Figure 8. Example of one phase of a basketball action

Figure number 9 shows Referee's Action coverage for quadrants that each of them has a jurisdiction. Number of quadrants are shown in brackets on the right.

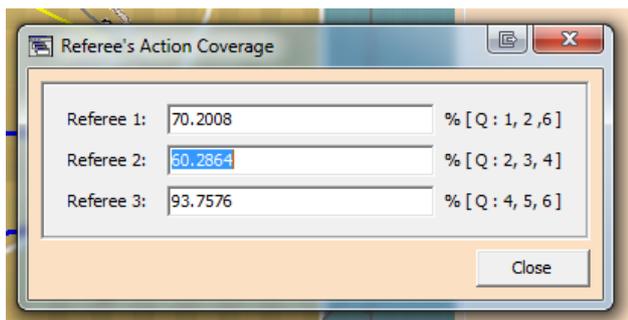


Figure 9. Referee's Action Coverage

IV. CONCLUSION

Developed solution showed satisfactory results, and the same solution is still in the development stage. During further development of the above mentioned solution, a migration is planned to an open source mobile platform. Since the complete code of a client application is written in the programming language C++, it is easy to modify the code in order to be accepted by some C+ GNU / Linux compilers. That way a client application would be ported to a of tablet / Pocket PC, and it would in the real sense, reminisce of a digital drawing board for basketball action drawing.

Plans for future development include:

- Development of tools for the analysis of user requirements, that would be used to determine if a neural network requires additional training or not
- Potentially establish the validity of a training set for a neural network based on the analysis user analysis
- If necessary additionally train neural network, then analyze additionally trained neural network and determine if it is better to train a neural network from the beginning, or to continue using the additionally trained neural network
- Analysis of the correctness of the results of a tool that calculates the percentage of individual action coverage from the basis of a basketball referee.
- Extend Referee's Action Coverage so it shows referees action coverage fore each quadrant for a referee that has jurisdiction over it.

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Reuse of the Test Information in Mutation Testing

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Abstract - One of the most important aspects of the projects for software development is the strategy of integration. The integration can be performed at once, from the top to the bottom or from the bottom to the top. Also, the integration can be performed critical part first or with the first functional subsystem of integration and only then to integrate the subsystems in separate phases. In general, if the projects are bigger, the strategy of integration becomes more important. Program testing is, in principle, a complicated process that must be done as systematically as possible, in order to provide adequate reliability and quality certainty. Program testing is often connected to discovery of "bugs". Software testing represents activity in detecting software failures so that defects may be discovered and corrected. Mutation testing represents a way to test a test.

I. INTRODUCTION

The basic idea of mutation testing is to seed lots of artificial defects into the program, test all defects individually, focus on those mutations that are not detected, and, finally, improve the test suite until it finds all mutations. Mutants can be created by mutating the grammar and then generating strings, or by mutating values during a production. Mutation can be applied to various artifacts, but it is primarily used as a program-based testing method. Program-based mutation uses mutation operators that are defined according to the grammar of a particular programming language. Mutation testing is used to help tester to make test data better. For planning and execution of tests, program testers must consider a program and its functions, inputs and their combinations, as well as environment where a program is to function. Specification is the key point to program testing. Testing activity proves whether a program matches its specifications. A good testing strategy includes an activity set, organized within well-planned sequence of steps, which finally prove software quality. Program testing is one of commercially most expensive activities. Testing proves, firstly, how much a program carries out a task it is intended for, and then how it behaves in different exploitation situations. This paper describes problems we encounter during a software testing. Every company must test software it designs. Nevertheless, this software still will have certain flaws or "bugs". This paper shows why "bugs" removal is so complicated and why testing is one of most important

activities. On the basis whether (and how much) a program is adequate for carrying out a certain job, testing may be defined as verification of program's match to its specifications (closely connected to program's correctness, which is a measure of how much a program satisfies its specifications) and testing its behavior within environment (closely connected to reliability of program, taken as immunity to illegal input data). Most important is to select test items for input values. Very small systems are often collected and tested in one phase. For the majority of real systems, this is not practical for two important reasons. The first is that the system would fail in many places at once and the attempts to debug and to re-test would be completely impractical [1]. The second is that the correspondence to the testing criteria of white box would be very difficult, for the big quantity of details separating the entrance data banks from the individual ciphers of the modules. In fact, the majority of integration testing is traditionally limited to the techniques of "black box" [2]. The big systems can demand many phases of integration, beginning with the collection of modules in low-ranged subsystems, and then the gathering of the subsystems into bigger subsystems and finally the composition of the subsystems of higher level into the whole system. . Software testing is faced with several problems. Bugs are not distributed uniformly across a program. This uneven distribution is known as the Pareto effect: "20% of modules contain 80% of the defects" [3]. Second problem represent risk, which is unevenly distributed. In every project there are some modules in which defects have serious consequences because they are frequently used, or because entire functionality depends on them. Tester would want his test suite to be focus on the defect-prone modules, and to make his testing efforts based on the risk, rather than achieving a specific coverage. In principle, every program should have to tests: one is hidden and not available to users, and other is visible. A debugger is a good example. Some programs may have self-testing programs. Formalism is connected to specification. A way in which program reacts to different input data is defined by specification. For instance, meaning of "input" and "output" may be considered in wider sense if input values within program are noted as x, and output as y. In this case, specification may be understood as a relation connecting input set to output set. From a specification itself even determination is not expected, meaning that

numerical program may give different precision results in different computers. [10]

II. MUTATION TESTING

The basic idea of mutation testing is to [4] seed lots of artificial defects into the program, (2) test all defects individually, focus on those mutations that are not detected, and, finally, (4) improve the test suite until it finds all mutations. This approach has a few benefits. First benefit is that tester can truly assess the quality of tests, not just to measure features of test execution. When modules with high risk are mutated, they can exhibit serious consequences. Third benefit comes with choice of good mutants. The more similar mutations are to real defects, the more likely you are to replicate the defect distribution in your program. Mutation is widely considered the strongest test criterion in terms of finding the most faults, but is also the most expensive. Having in mind whether and how much a program is suitable for carrying out a given job, program testing may be defined as:

- checking the harmonization in program realization with its specification (related to correctness of a program, as the measure in which a programs satisfies its specification)
- checking units behavior in environment (closely related with program reliability, as a resistance to irregular input data and environmental disturbances)

In works of James Whittaker [5, 6] may be seen why program is testing so hard. . It also gives several approaches which testers must know and should apply. The good and efficient tester knows testing problems, knows well environment of the software, uses different testing techniques, has means to recognize errors and uses different methods and techniques to remove them. Methods given here are aimed to give testers answer to a question what they mean when they say that program system was tested. Program testing begins early, often coinciding with specification requirements. Many authors - [6] [7] [8] [9] - call errors a "bugs". Errors are prone to widen. An error in beginning may grow during designation, and then increase during coding. Otherwise, correctness and reliability of a program are not mutually conditioned (i.e. they are orthogonal). A correct program may be unreliable, for example if it has no built-in protection from irregular input data. As a consequence, program may fail with undecipherable system message. For example, if a program written in Fortran has no built-in check-up base for raising the power by real number, in carrying out this operation for negative base or a base equal to zero, a system message appears regarding impossible logarithm of negative number - which is an operation with seemingly no connection to raising the power. In contrary, reliable program must not be a correct program either, for example if it is not matching the specification. If testing reveals large errors, further testing is necessary since quality and reliability are not acceptable. If errors are minor and were easy to find, it may be taken as that quality and reliability are acceptable.

Even a most thorough testing always leaves (unpleasant) possibility that some errors are found by the *user*. There are several reasons:

- Sequence of commands being executed is different than during the testing. This is especially important, since this sequence determines whether a program will function or not.
- An untested part of program is activated. One of reasons is that programmers, limited by deadlines or expenses, did not test this part of program.
- User used untested activity. Due to vast number of combinations, tester had no time to test them entirely. Programmers also may make mistakes in selection of these values
- Environment of given program was not tested, which is connected to expenses or deadlines. Since tasting is carried out in laboratories, a question rises whether we made true copy of original where a given program must exist, or did we make user combination of hardware, operative system, and application.
- There are system errors, time-caused, so they occur only when a system and environment are in certain conditions.

Here are given only some of problems which programmers and users may meet.

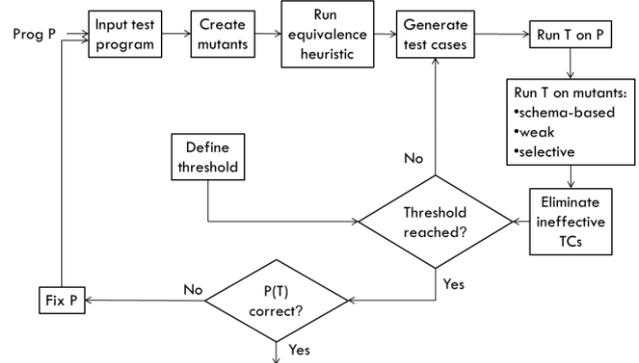


Figure 1. Testing programs using Mutation testing

The tester submits the program which should be tested. Automated system starts changing original statements by creating mutants. Optionally, those mutants are then analyzed by a heuristic that detects and eliminates as many equivalent mutants as possible, as shown in Fig 1. A set of test cases is then generated automatically and executed against the original program, and then against the program that contains mutants [6]. If the output of a mutant program differs from the original (correct) output, the mutant is marked as being dead and is considered to have been strongly killed by that test case. Dead mutants are not executed against subsequent test cases. Test cases that do not strongly kill at least one mutant are considered to be "ineffective" and eliminated. Once all test cases have been executed, coverage is computed as a mutation score

(ratio of dead mutants over the total number of non-equivalent mutants). Mutation score of 1.00 means that all mutants have been detected.

III. WHEN IS THE PROGRAM TESTING TO BE STOPPED?

This is the most frequent question encountered by testers. Here are some possible answers:

1. When you don't have time,
2. When further testing provokes new denials,
3. When further testing does not discover new errors,
4. When you cannot create any new testing item,
5. When you arrive to the point in which reduces the number of responses,
6. When the requested covering is reached,
7. When all the errors are eliminated.

Unfortunately, the first answer is the most frequent one, and the seventh cannot be guaranteed by anyone. This leaves the tester somewhere in the middle. The models of software reliability offer the solutions that support the second and the third answer, both of them are largely used in the industry. The fourth answer is insecure: if you followed the procedures and the instructions that we talked about, this is probably the good solution. On the other hand, if the reason is lack of motivation, this solution is unfortunate as much as the first one. The fifth solution is attractive: implies the continuation of serious testing, but the discovering of new errors reduces dramatically. The further testing becomes very expensive and maybe it will not be discovered any new error. If the costs (or risk) of the rest of the errors can be defined, the advantage is clear. The module testing criteria can often be generalized in some possible ways. As discussed above, the most frequent generalization is to correspond to the module testing criteria in the context of integration, using the whole program as the environment for testing of the drivers for every module. But, this trivial generalization does not use the difference between the module and the integration testing. The application on each phase of the poly-phase strategy of integration, for example, leads to excessive number of unnecessary testing.

IV. MUTATION OPERATOR DEFINITION

Mutation operator represents a rule that specifies syntactic variations of strings generated from grammar. Mutant represents result of one application of mutation operator over ground string. There are two issues in applying mutation operators. First is should more than one mutation operator be applied at the same time to create one mutant? Strong empirical and theoretical evidence point that only one element should be mutated at a time. Second issue is should every possible application of a mutation operation to a ground string be considered? Reason for this is that mutation subsumes a number of

other test criteria, and if some operators are not applied, then that substitution is lost.

When derivation is mutated to produce valid strings, the testing goal is to "kill" the mutants by causing the mutant to produce different output. Thus, mutation

When a grammar is mutated to produce invalid strings, the testing goal is to run the mutants to see if the behavior is correct. The coverage criterion is therefore simpler, as the mutation operators are the test requirements. In this manner we have mutation operator coverage (MOC) and mutation production coverage (MPC). Definition for MOC is: For each mutation operator, test requirement contains exactly one requirement, to create a mutated string m that is derived using the mutation operator. Definition for MPC is: For each mutation operator, and each production that the operator can be applied to, test requirement contains the requirement to create a mutated string from that production coverage (MC) equates to killing the mutants. The amount of coverage is usually written as percent of mutants killed and is called mutation score. Definition for MC is: For each mutant $m \in M$, test requirement contains exactly one requirement, to kill m .

The number of test requirements for mutation depends on the syntax as well as the mutation operators. In most situations, mutation yields more test requirements than any other test criterion.

The thing that we would certainly want to know about the sequence of testing items is how efficacious they are, but it is necessary to clear what the "efficaciousness" means. The easiest way is to be dogmatic: to define the method, to use it for the testing items generating and then to execute the testing items. But this can be corrected if we reduce the dogmatism and if we demand that the testers choose "appropriate methods". We can get even bigger improvement if we compose appropriate hybrid methods.

The structure testing techniques give also another choice for the testing efficaciousness. We will be able to examine the sequence of testing items in the sense of ways that are passed in execution. When the certain way is passed more than once, we can talk about the redundancy. Sometimes the redundancies have also the purpose.

The best interpretation of the testing efficaciousness is (and this is not a miracle) the more difficult one. In fact, we want to know how much the sequence of testing items is efficacious in discovering errors in the program. This is problematic for the two reasons: the first it that it is supposed that we know all errors in the program. But this is moving into the same cycle: if we knew them, we would correct them. Since we don't know all errors in the program, we will not know, maybe never, if the testing items, on the grounds of the given method, succeeded in discovering them. The second reason is more theoretic: demonstration that the program is without errors corresponds to the famous problem of stopping from the computer science, for which it is known that it doesn't have the solution. The best think we can do is to go back, from the types of errors. When we have certain type of error, we can choose the testing method (functional or structural) and it is most probable that it will discover the

errors of that type. If we connect it with the knowledge related to most probable types of errors, we will get the pragmatic approach to the testing efficaciousness. This implements furthermore if we follow the types (and the frequency) of errors in the software that we develop.

V. CONCLUSION

The testing activity shows if the given software is harmonized with the specification. The specification is key thing in testing. So, as the results of testing are collected, the proofs about quality level and program reliability appear. If the testing often discovers the important errors, the quality and the reliability of the program can be considered insufficient and the further testing is necessary. On the other hand, if the errors are minor and easy to be corrected, then the level of quality and reliability is acceptable. The testing cannot say definitively if the program is correct, because the not discovered errors can remain in the program even after the most voluminous testing. First paper about mutation testing was published 30 years ago. Only now mutation testing becomes widely implemented. The reason for this is that automated testing is much more widespread than it was 10 years ago, and there is no mutation testing without it. Computing power keeps on increasing, and we can begin to afford the huge computing requirements imposed by mutation testing. The program testing is often identified with the discovering of any kind of errors. There is no sense to test errors that most probably do not exist. It is much more efficacious to think well about the types of errors that are most probable (or provoke the biggest damages) and then to choose the testing methods that will certainly be able to discover this kind of errors. The

success of one set of testing data corresponds to the successful execution of detailed program testing. One of the main questions that appears in program testing is the reproduction of the error (the testers discover the errors and the programmers eliminate the bugs).

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Applied Robotics - Moving Through an Obstacle Course

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Abstract - This paper describes the concept of the navigation system for a mobile robot. The system is using a combination of two navigation algorithms: self-learning neural network, necessary to form a movement plan for a robot, and a collision-free control algorithm based on heuristic neuro-fuzzy approach. The basic task of neural network is to generate initial path. Heuristic rule bases for collision free algorithm are limited and do not cover all situations. Main contribution of proposed navigation is related to neural network property to supplement special cases that are not covered by present heuristic rules from the rule base. Both algorithms are adapted and implemented to navigate real platform of a mobile robot equipped by two independent wheel drives, encoders and a set of short-range sonars. The combined reactive algorithm (using two control methods) is used in real time for obstacle navigation in robotized system. Navigation algorithms are placed into a PC, which is connected to mobile robot by wireless and wired links. Experiments have shown ability of collision-free navigation of mobile robot in real time.

I. INTRODUCTION

Industrial robots are implemented in well-structured environment, for well-known and repeatable work tasks that may be programmed in advance. On the other hand, in automated mobile robots adaptation to changes of environment is the imperative. Mobile robots are moving in a space by walking mechanisms with several legs, by wheel platform, or by caterpillar tread. The robot should have sensors to obtain information about its environment. In these sense sonars, electronic compasses, infrared sensors, digital cameras, microphones and/or encoders may be used [1, 2].

Procedures for navigation and direction of mobile robot are enabling its autonomous movements in unknown environment and avoiding obstacles while it moves towards given target [3, 4]. In [3] the attempt is described to obtain data from the encoder, in order to enable navigation in real time, as much as it is possible due to communication speed between the robot and the computer. This was not always possible due to long time needed to obtain results and to send commands to the robot. Based on information obtained from sensors, mobile robot must be able to move within unknown or

partially unknown environment. Remotely controlled semi-autonomous robot with multimedia abilities was considered in [5]. The speaker localization problem for service robots was presented in [6]. In paper [7] are described problems of autonomous mobile robot navigation through unknown environments. In [8] the obstacle-configuration predictor is described that uses virtual force concept for fusing data from a camera and multiple ultrasonic sensors. In paper [9], a new method is presented for real-time obstacle avoidance of a mobile robot based on a fuzzy-neuro network structure. That method enables continuous and fast motion of the mobile robot without stopping at obstacles.

In order to develop algorithms for moving a mobile robot, it is useful to realize a mobile robot with open physical architecture, which enables adding new hardware and software modules for navigation and communication. One such realization of a mobile robot is described in this paper. The paper also describes realization of navigation procedures in a mobile robot, obtained by combining two well-known approaches: self-learning neural network (NN) [10] and fuzzy Kohonen clustering network (FKCN) [8], [9], and [11]. Proposed robot navigation method is pure sonar based which embedded real time implementation is much simpler comparing with similar cameras navigation systems.

Both algorithms enable precise and efficient generating a robot's path in real time. A flaw of self-learning NN algorithm is complexity for a large number of neurons needed to form a detail environment map, and its sensitivity to false readings from sensors. The FKCN algorithm is more robust at sensor false readings, but depends on quality and number of heuristically defined rules. In order to improve quality in navigating the mobile robot, a navigation process was realized, comprising combination of self-learning NN and FKCN approaches to compensate insufficient/incorrect information from acquisition module (sonar readings) generally exposed in real environments and to minimize deviation from path generated at the start. The approach presented in this paper differs from the methodology taken in [8], [9], and [11].

The approach in paper [8] relies on a navigation using a multi-sensor predictor, while in this particular case a

robot uses the sonar in order to detect obstacles and move between them. Based on findings presented in papers [9] and [11] a concept that will be presented in this paper was created. Newly formed concept, from concepts presented in papers [9] and [11], differs on configuration, combination and modification in order to produce a new solution for an existing problem.

II. DESCRIPTION OF BASIC MOBILE ROBOT COMPONENTS

Development system consists of mobile robot and command station, which in general case is a personal computer. Mobile robot is connected to command station.

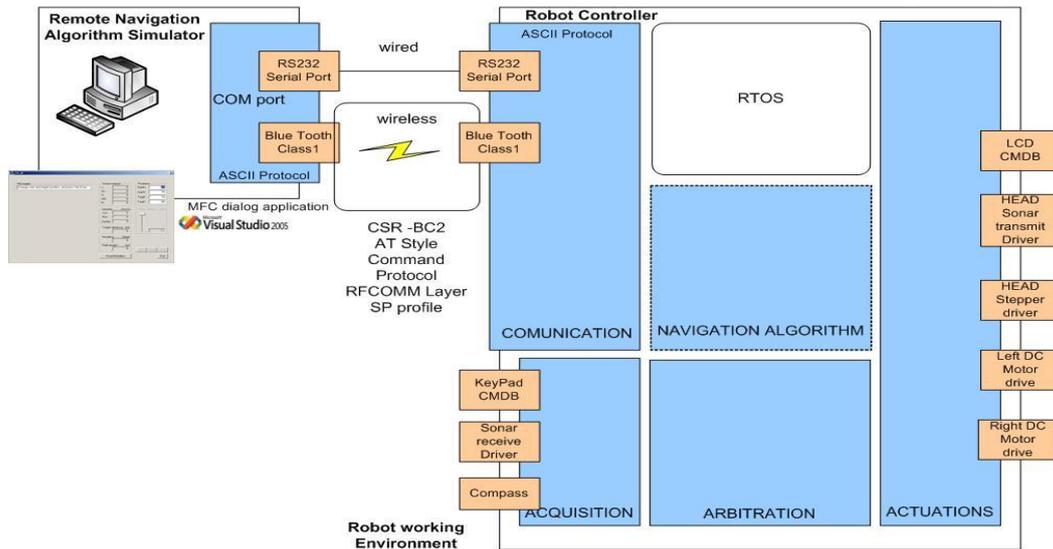


Figure 1. Structure of a developing system

In the first stage, path of the robot is formed towards given target, based on readings from sensors about robot's proximity and optionally, based on *a priori* given environment plan, if it is available [12]. For that purpose, algorithm for forming self-learning topological neural network is used [10]. This enables efficient forming of an initial path for the robot's movement, which may be very complex. In the second stage, approach based on heuristic neuro-fuzzy network is used in part of robot's movements [11]. As opposite from the first approach, this one is more suitable for use in short-range sonar simulations or with unreliable sonar readings. Moreover, it enables continuous and fast moving of the robot, without stopping when it has to go around obstacles. Final outputs of neuro-fuzzy network are commands necessary to control movements of mechanically independent wheels of the robot. Different speeds of the left and right wheel enable the robot to change direction, to avoid obstacles and to reach the target given in advance. Description algorithms were verified by computer simulations and in experimental Trilobot, manufactured by Arrick Robotics [13]. In order to develop and verify a system of robot navigation, it was necessary to develop programming environment by merging of navigation and communication procedures between PC computer and Trilobot mobile robot. Description of this development system and of mobile robot is given in chapter 2. Chapter 3 is giving description of heuristic neuro-fuzzy approach. Chapter 4 gives descriptions of scenarios for robot navigation, and remark

There are two applications for linking between the robot and the command station:

- Wired link – using standard RS232 link
- Wireless link – using RF two-way radio modules.

The command station is running a program that navigates the robot in previously mentioned algorithm. Command unit, by programming communication layer, obtains data from sensors and manages actuators in mobile robot. In the robot, the basic routines for acquiring data from sensors, motors control and communication with command station are running. See figure 1.

connected to initialization of path using self-learning NN [10], as well as results obtained in experimental Trilobot mobile robot, in conditions of laboratory environment. The last chapter gives comments and conclusion.

Fig. 2 shows Trilobot mobile robot used in development and in tests.

The robot has two DC drive motors. These motors with permanent magnets are regulated independently using PWM controlled H-bridges.

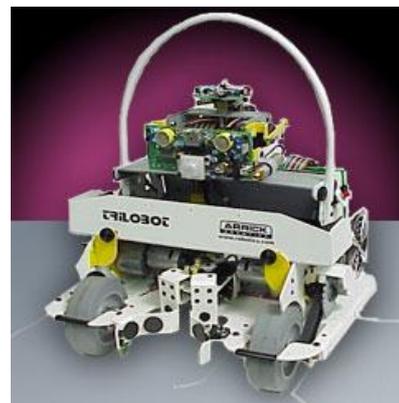


Figure 2. Trilobot (Arrick Robotics, USA) experimental robot

Motors were linked by axis with incremental sensors-encoders. Optical encoders consist of toothed wheel and photo element, enabling determination of speed and position of robot's wheels. Two servomotors with reducers enable head movements by 180° by azimuth, as well as 90° upward and 15° downward by vertical. On the head, there is ultrasonic sensor for distance measuring. In this navigation algorithm for mechanical space scanning, main sensor is the sonar [12]. The scanning is based on synchronized deflection of ultrasonic transmitter and receiver, using servomotors. Deflection angles are depending on space configuration in which robot is moving and of two-way radio characteristics. The sonar is the basic sensor for measuring distances; in future, a video camera will be used for determination and following of the target. Measuring distances by ultrasonic perception is being done by sending the packages of high-frequency sonic signals by sensory primer in sonar and by measuring the time of flight for first and other echoes of sonar signals. Ultrasonic receiver and transmitter are mounted on the moving head of the robot, enabling searching for objects in the "field of vision" of robot's head. Area of distance measuring (15 cm – 3 m) and its accuracy (3 cm) is not always very convenient, since when an object is located outside measuring area (15 cm – 3 m), unexpected results are obtained. Moreover, objects as carpets or fabrics absorb sound wave energy so the returning signal is too weak. Therefore, multiple measurements are needed in order to improve precision and accuracy of distance measurements. Therefore, main problem is connected to the choice of sensory components (sonar type) and to the control circuit that directly influences range and resolution of measurements. Basic construction used wide beam sonar module which consists of receiving and transmitting 400ST/R160 type, with 40 kHz central frequency and total angle beam of 55 degrees. Amplitude characteristics in angle function are shown at Figure 3, left. A basic cause of potential problems was noted regarding obstacle reflection/echo from adjoining sonar's. This was especially expressed in use case when robot was located in small space – reflections from walls and objects were abundant. The improvement was to use a sequence of narrow-beam sonar's and to introduce a pause between sonar excitations. Basic flaw of sonar module is a wide angle beam, which may be compensated in part by replacing present sonar module by a new one, with narrow amplitude characteristic (15 degrees) for angle beam, as shown in Fig. 3 right.

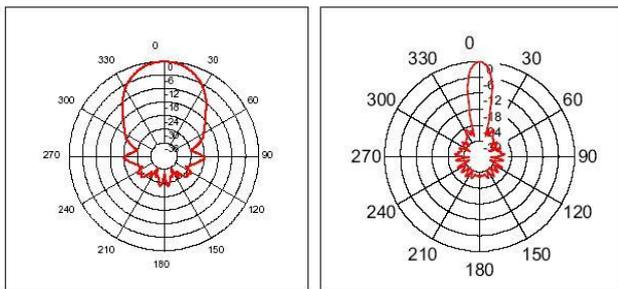


Figure 3. Characteristics of amplitude in function of angle of sonar receiver, type 400ST/R160

III. THE EXPERIMENTAL VERIFICATION

The robot's path is generated by training unsupervised NN. For given space, robot's movements are formed as a 2D orthogonal topologic map and for its nodes. By using Kohonen self-organizing principles of learning, trained NN results in generated path for robot movements. Figure 4 presents a basic navigation framework schema.

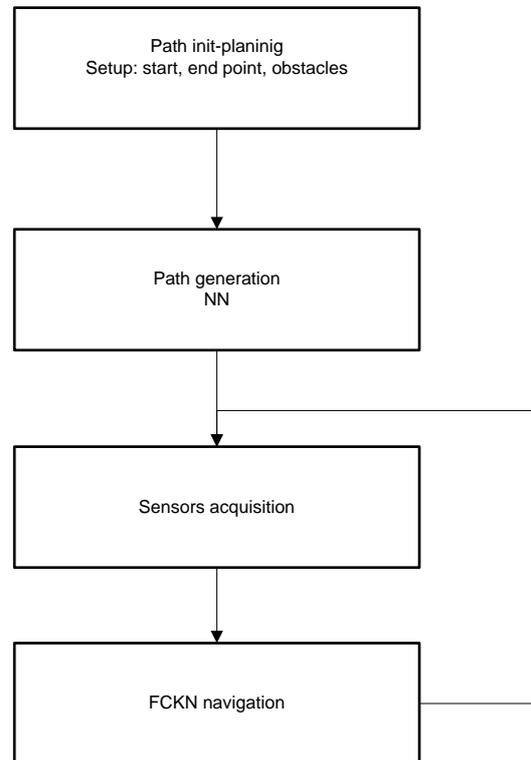


Figure 4. Basic framework of the algorithm

Condition space of neural network is formed as a 2-D grid with connections between neighboring neurons. The algorithm is executed using the neuron activation function from [10]. The peak and higher parts of this area are the target and directions toward the target, while its lowest parts are obstacle areas, which should be avoided. By finding neighboring neurons from current position with highest activation, robot's path to the target is being formed. Optimal path of the robot is generated in real time, without any previous knowledge about its surroundings and without optimization of any general target function. The algorithm is efficient and may be executed in real time.

Figure 5 and 6 illustrate a 2-D grid of a neural network and activation values of neurons that describe robot's environment. The robot is shown as a point in two-dimensional square space with defined resolution. The environment of mobile robot is defined as space of 30x30 points, which in fact corresponds to neural network of the same size. Starting position of a robot is in point (15, 15) which is inside the concave U-shaped obstacle, while the moving target is situated behind the U-shaped obstacle.

Figure 5 shows optimal path of the robot towards the target as well as the shape of activity area of neural network. The appearance of activity area from the Figure

6 corresponds to the moment when a robot had reached its moving target. Here it is important to note that a behavior of mobile robot is much better if a new target position does not take into account neural activity values obtained for the previous position, but they are calculated again with zero initialization.

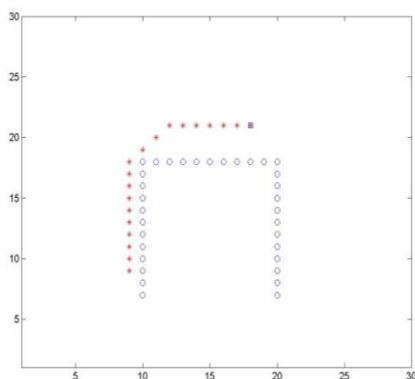


Figure 5. Optimal path of a mobile robot

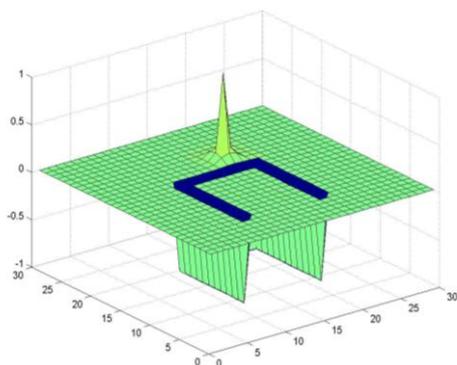


Figure 6. Area of Neural Network neural activation

IV. CONCLUSION

This work describes a mobile robot platform that was a basis for development and implementation of navigation algorithm, based on ultrasonic space scanning. Algorithm for navigation of mobile robot uses two approaches. First one is based on self-learning neural network and is used for initial forming of robot's movement path to the target. The second method is based on heuristic fuzzy-neural network, and has a task to follow the initial path and to move in the real environment based on information obtained by sonar. Information obtained by sonar is being used so the robot could detect and recognize the shape of the obstacle. Based on recognized obstacle types, mobile robot forms picture of its present surroundings and generates speeds for two independent-drive wheels to avoid obstacles and follow initial path. Navigation algorithms and adequately equipped robotic platform that were used have shown satisfactory performances in

moving and avoiding obstacles in real laboratory conditions.

Combination of self-learning neural network (NN) and fuzzy Kohonen clustering network (FKCN) algorithm and methods provides a task separation environment. Clear advantage of self-learning neural network is that a robot will learn from an example, while a FKCN will be used in order to detect and recognize elements and obstacles. Also, the open physical architecture enables an easy robot reconfiguration in order to enhance its properties by adding new components.

Proposed algorithm combination enhances the performance of a mobile robot against partial or single implementation of each algorithm separately.

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Ontology and Taxonomy of Electronic Services in Guarantee Fund

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Abstract - This paper proposes an approach to building an ontological model of the electronic services of the Guarantee fund of Autonomous Province of Vojvodina (APV). We analyzed the Open Group technical standards. This standards defines the concepts, terminology, and semantics of SOA in both business and technical terms. On the basis of the Open Group technical standards we create ontology of the electronic services of the Guarantee Fund APV. Created Ontology is the basis for the implementation of SOA and represent a link between business requirements and IT solutions.

I. INTRODUCTION

The implementation of electronic public services is a process which implies the determination of objectives and actions necessary for the modernization of the business and the inclusion of as many citizens as possible in the activities that are the responsibility of the financial funds of the state government. The process is very complex, and can be divided into several groups of activities: planning, design, implementation and training. The term public broadcast service in this context will be considered a set of tasks that a citizen or company may do with the services of the Guarantee Fund mediated by electronic communication mechanisms and a set of activities performed between APV Guarantee Fund and commercial banks, the Association of Serbian Banks. Service-Oriented Architecture (SOA) [1] is a flexible set of design principles used during the development and integration of computer systems. A system based on SOA, functions as a system of interoperable services that can be used within multiple separate systems. SOA also enables users services and Web-based applications to be aware of the existence of SOA. XML [2] is commonly used to connect to the SOA services. SOA define ways of implementing different applications for the Web-based environment and uses multiple implementation platforms. Instead of defining the API, SOA defines the communication protocols and functionality. SOA stands service functions into separate units and allows the individual services and their functionality to be available over the network and that they can be reused and combined in the development of the new applications.

This paper will present methodology of electronic services ontology construction and implementation of the Open Group technical standards.

The paper is organized as follows. The second section provides an overview of the standards for building ontology for services. The third section presents an identification of the public services provided by the Guarantee fund APV. The fourth section show the created ontology for the public services of the Guarantee fund APV. In the last, fifth section, concluding remarks and directions for further research are given

II. ONTOLOGY FOR SERVICES

Formal Ontology of the electronic public services of the Guarantee Fund APV should be created in a way that enables the implementation of SOA. That the standards described in the next chapter defines a formal ontology for Service-Oriented Architecture (SOA).

A. An Upper Ontology for Services (W3C)

While creating ontology for services the authors [3] is motivated by the need to provide three essential types of knowledge about a service: *What does the service provide for prospective clients? How is it used?* How does one interact with it? The answer to this question is given in the "grounding." A grounding provides the needed details about transport protocols. Instances of the class Service have a supports property referring to a ServiceGrounding. The class Service provides an organizational point of reference for a declared Web service; one instance of Service will exist for each distinct published service. The properties *presents*, *describedBy*, and *supports* are properties of Service. The classes ServiceProfile, ServiceModel, and ServiceGrounding are the respective ranges of those properties. Each instance of Service will *present* a ServiceProfile description, be *describedBy* a ServiceModel description, and *support* a ServiceGrounding description. The details of profiles, models, and groundings may vary widely from one type of service to another, that is, from one instance of Service to another. But each of these three service perspectives provides an essential type of information about the service, as we explain below. The service profile tells "what the service does", in a way that is suitable for a service-seeking agent (or matchmaking agent acting on

behalf of a service-seeking agent) to determine whether the service meets its needs. This form of representation includes a description of what is accomplished by the service, limitations on service applicability and quality of service, and requirements that the service requester must satisfy to use the service successfully.

The service model tells a client how to use the service, by detailing the semantic content of requests, the conditions under which particular outcomes will occur, and, where necessary, the step by step processes leading to those outcomes. [6] That is, it describes how to ask for the service and what happens when the service is carried out. For nontrivial services (those composed of several steps over time), this description may be used by a service-seeking agent in at least four different ways: (1) to perform a more in-depth analysis of whether the service meets its needs; (2) to compose service descriptions from multiple services to perform a specific task; (3) during the course of the service enactment, to coordinate the activities of the different participants; and (4) to monitor the execution of the service. [7] A service grounding ("grounding" for short) specifies the details of how an agent can access a service. Typically a grounding will specify a communication protocol, message formats, and other service-specific details such as port numbers used in contacting the service. The upper ontology for services specifies only two cardinality constraints: a service can be described by at most one service model, and a grounding must be associated with exactly one service. The class *ServiceProfile* provides a superclass of every type of high-level description of the service. *ServiceProfile* does not mandate any representation of services, but it mandates the basic information to link any instance of profile with an instance of service. There is a two-way relation between a service and a profile, so that a service can be related to a profile and a profile to a service. These relations are expressed by the properties **presents** and **presentedBy**.

B. Open group SOA ontology technical standards

The purpose of this Technical Standard is a improving alignment between the business and information technology communities, and facilitate SOA adoption. It does this in two specific ways:

1. It defines the concepts, terminology, and semantics of SOA in both business and technical terms
2. It potentially contributes to model-driven SOA implementation.

The ontology is represented in the Web Ontology Language (OWL) [4] defined by the World-Wide Web Consortium (W3C). OWL has three increasingly expressive sub-languages: OWL-Lite, OWL-DL, and OWL-Full. This ontology uses OWL-DL, the sub-language that provides the greatest expressiveness possible while retaining computational completeness and decidability. The ontology contains classes and properties corresponding to the core concepts of SOA. The class hierarchy is shown on Figure 1.

This ontology [5] can be used as a core for domain-specific ontologies that apply to the use of SOA in particular sectors of commerce and industry. *System* and *element* are two of the core concepts of this ontology. Both are concepts that are often used by practitioners, including the notion that systems have elements and that systems can be hierarchically combined (systems of systems).

Using an organizational example, typical instances of **Element** are organizational units and people. Whether to perceive a given part of an organization as an organizational unit or as the set of people within that organizational unit is an important choice of abstraction level:

- Inside the boundary of the organizational unit, to express the fact that an organizational unit uses the people that are members of it. Note that the same person can in fact be a member of (be used by) multiple organizational units.
- Outside the boundary the internal structure of an organizational unit must remain opaque to an external observer, as the enterprise wants to be able to change the people within the organizational unit without having to change the definition of the organizational unit itself.

A **System** is an organized collection of other things. Specifically things in a system collection are instances of **Element**, each such instance being used by the system.

In the context of the SOA ontology we consider in detail only functional systems that belong to the SOA domain. Note that a fully described instance of **System** should have by its nature (as a collection) a *uses* relationship to at least one instance of **Element**.

Since **System** is a subclass of **Element**, all systems have a boundary and are opaque to an external observer (black box view). This excludes from the **System** class structures that have no defined boundary. From an SOA perspective this is not really a loss since all interesting SOA systems do have the characteristic of being possible to perceive from an outside (consumer) perspective. Furthermore, having **System** as a subclass of **Element** allows us to naturally express the notion of systems of systems – the lower-level systems are simply elements used by the higher-level system.

System is defined as disjoint with the **Service** and **Task** classes. Instances of these classes are considered not to be collections of other things. **System** is specifically not defined as disjoint with the **HumanActor** class since an organization in many cases is in fact just a particular kind of system. We choose not to define a special intersection class to represent this fact.

People, organizations, and the things they do are important aspects of SOA systems. **HumanActor** and **Task** capture this as another set of core concepts of the ontology. Both are concepts that are generic and have relevance outside the domain of SOA. For the purposes of this SOA ontology we have chosen to give them specific scope in that tasks are intrinsically atomic and human

actors are restricted to people and organizations. In addition, it defines the following properties: **does** and **doneBy**

HumanActor is defined as disjoint with the **Service** and **Task** classes. Instances of these classes are considered not to be people or organizations.

A *task* is an atomic action which accomplishes a defined result. Tasks are done by people or organizations, specifically by instances of **HumanActor**. A task is used when the work in the process cannot be broken down to a finer level of detail. **Task** is defined as disjoint with the **System**, **Service**, and **HumanActor** classes. Instances of these classes are considered not to be atomic actions.

Public services is presented by the following classes of the ontology: **Service**, **ServiceContract**, **ServiceInterface**, **InformationType**. In addition, it defines the following properties: **performs** and **performedBy**, **hasContract** and **isContractFor**, **involvesParty** and **isPartyTo**, **specifies** and **isSpecifiedBy**, **hasInterface** and **isInterfaceOf**, **hasInput** and **isInputAt**, **hasOutput** and **isOutputAt**.

Service contracts explicitly regulate both the interaction aspects (**hasContract** and **isContractFor** properties) and the legal agreement aspects (**involvedParty** and **isPartyTo** properties) of using a service. The two types of aspects are formally captured by defining the **interactionAspect** and **legalAspect** datatype properties on the **ServiceContract** class.

In the context of the SOA ontology will be consider only SOA-based services. Other domains, such as Integrated Service Management, can have services that are not SOA-based and hence are outside the intended scope of the SOA ontology. **Service** is defined as disjoint with the **System**, **Task**, and **HumanActor** classes. Instances of these classes are considered not to be services themselves, even though they may provide capabilities that can be offered as services.

Interacting with something performing a service has *effects*. These comprise the outcome of that interaction, and are how a service (through the element that performs it) delivers value to its consumers. The concept of *effect* is captured by the **Effect** OWL class. The **Effect** class purely represents how results or value is delivered to someone interacting with a service. Any possible internal side-effects are explicitly not covered by the **Effect** class.

Effect is defined as disjoint with the **ServiceInterface** class. Interacting with a service through its service interface can have an outcome or provide a value (an instance of **Effect**), but the service interface itself does not constitute that outcome or value.

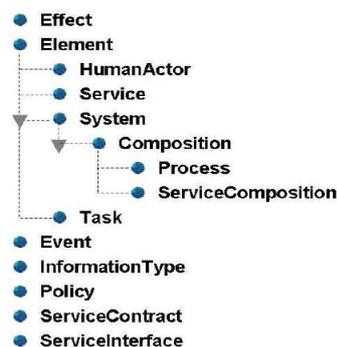


Figure 1. Class hierarchy

III. GUARANTEE FUND PUBLIC SERVICES IDENTIFICATION

State development funds are an interventionist mechanism by which the state affects the development of small and medium enterprises. These are institutions set up by authorities of different levels (state, province, local government) and whose activity is aimed at stimulating the development of small and medium-sized enterprises while reducing risk and transaction costs related to the implementation of stimulating instruments (e.g. loans) of Small and Medium Enterprises.

Guarantee Fund was established with the aim of providing additional guarantee potential, more favorable credit conditions, which are manifested through lower interest rates and by reducing the cost of guaranteeing for the small and medium enterprises (SME) in Autonomous Province of Vojvodina.

Operation of the fund is regulated by the following documents: *APV Guarantee Fund Statute*, *Rules of Operation of the Guarantee Fund APV*, *annual work program of the Guarantee Fund of APV*.

Analysis of the basic functionality of business processes and interconnection of business processes and participants identifying public electronic services of the Guarantee Fund of APV. See Table 1.

TABLE I. GUARANTEE FUND PUBLIC SERVICES IDENTIFICATION

Public Service	Description
<i>Receipt of tender documents.</i>	<ul style="list-style-type: none"> • Checking the completeness of tender documentation • Receipt of tender documents
<i>Preparing documents for the Commission for issuing guarantees</i>	<ul style="list-style-type: none"> • Preparation of hits registered participants call screening solvency
<i>Evaluating credit rating of the participants</i>	<ul style="list-style-type: none"> • Analysis of the creditworthiness and risk factors • Draft proposals for the issue of guarantees
<i>The formation of the decision to issue guarantees</i>	<ul style="list-style-type: none"> • The formation of the decision to issue guarantees
<i>Preparing documents for the signing of guarantee</i>	<ul style="list-style-type: none"> • Preparation for the issuing guarantees

IV. GUARANTEE FUND ONTOLOGY FOR SERVICES

Typology of the administrative activities of the government development funds may be presented in four levels:

1. Identification level - identification of the type of services offered to end users
2. Specifications level - establishing administrative procedures and documents for the identified type of service
3. Interaction level - communication by achieving a specified procedure with the aim of ensuring the implementation of services (for example, the signing of the contract)
4. Transactions level - Implementation services (for example, issue a guarantee)

Important role in the development of an ontology conceptualization and organization of knowledge. The task conceptualization to informal knowledge into an ontological concept with the help of professionals in the area that can be modeled by ontology. Core classes of the Guarantee fund ontology are shown on Figure 2.



Figure 2. Core classes of the Guarantee fund ontology

Following the recommendations described in the technical standards for the creation of ontology of the electronic services in SOA as a W3C recommendation, ontology of the electronic services of the Guarantee Fund of APV is modeled as shown on Figure 3.

A. Guarantee fund services taxonomy

Classes of internal and external services that are invoked for executing the work procedures of issuing guarantees are described in this taxonomy. The taxonomy is shown on Figure 3.

The following classes are defined: InternalServices and ExternalServices. Internal Services are the services that are provided by the Fund, while External services are those that are provided by third parties like banks, other administrative bodies, etc. Both have same properties *SubClass of* and *availableOn*. The property *SubClass* identifies the structural position of the concept within the *Services* taxonomy, while the property *availableOn* – indicates service provider URI.

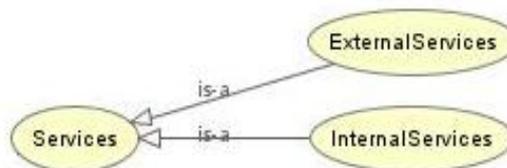


Figure 3. The Services taxonomy

Table 2 presents the classes of the concept and their Properties.

TABLE II. CONCEPT OF CLASSES AN THEIR PROPERTIES

Name	Properties	Individuals		
	Relations	Name	Property	Property Value
InternalServices	<i>SubClass of availableOn</i>	Service1	<i>PresentedBy</i>	MService1
		Service2		MService2
		Service3		MService3
		Service4		MService4
		Service5		MService5
		Service6		MService6
ExternalServices	<i>SubClass of availableOn</i>	<i>CreditService, BankService, NBService</i>		

Members of the class InternalServices (Service1 etc.) are presented by the *PresentedBy* property. This property points to the service profile (MService1) that presents the service. Service profile is described using following properties: *HasInput, HasOutput, HasLocation, HasPrecondition, HasResult, Presents*.

V. CONCLUSION

eGovernment solutions represent a major challenge in redefining the role of public administration agencies and organizations. Creating and using ontologies for SOA and

modeling systems that would speed up and automate the work of state administration, creates prerequisites for technical and organizational interoperability of different government agencies.

In this paper we identifies and analyze the electronic public services of the Guarantee Fund APV and presents a method for the semantic description of electronic services using semantic markup standards that provides service-oriented architecture systems. We analyzed the Open Group technical standards for the creation SOA Ontology and the W3C recommendation for creating ontologies for

public electronic services. Modeled ontology of the electronic public services shows a portion of an ontology that describes the public electronic services of the Guarantee Fund. Created ontology is a combination of The Open Group SOA Ontology and upper ontology for services presented by the W3C. Further research should focus on the development of standards for describing and creating ontologies of the administrative processes within the domain of state bodies. In this way, we would ensure, among other things, the basis for fast and efficient creation of an information systems of the state administration, standardized in the aspects of interaction, visualization, maintenance and generation.

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Information Technology Support to Virtual Teams – Advantages and Disadvantages

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Abstract - With advancement of information and communication technologies (ICTs), the way of doing job is going through radical change. Presently, many employees have virtual workplaces so they can work virtually from home and the other location remote from their organizations. Virtual workers can be organized in virtual teams with the aim to implement common projects and work activities. The main feature of all virtual teams is that team members have to use ICT for communication and collaboration in order to achieve expected effects. Also, all virtual teams, in comparison with traditional teams, have to transcend remoteness, time and organizational barriers and it is possible only by ICT. In focus of the research are features, advantages and disadvantages of virtual teams and ICTs which can be used by virtual teams.

I. INTRODUCTION

Virtual organization is flexible network of independent entities connected by information and communication technologies (ICTs) with the aim of sharing the skills, knowledge and the other resources. Virtual organization uses interactions supported by ICT more than physical interactions and it is based on alternative work arrangements such as telework, virtual offices and virtual teams. Telework is a work arrangement where employee does a job from location that is remote from physical offices in organizations. Instead of going to physical offices in organizations, employees work from home or some telework center. Doing in that way, the employees make virtual office environments based on telecommunication networks. In these environments, teleworkers can be organized in virtual teams because they are not present on the same location and have no face-to-face interaction.

The main objective of this paper is to analyse advantages and disadvantages of virtual teams and to give brief review of ICTs which can be used for support of virtual teams. The paper is based on researches which treat virtual teams from several aspects such as technological [1] [2] [3], organizational [4] [5] [6], managerial [7] [8] [9], psychological [10] [11] [12] [13] and performance [14] [15] [16] aspects.

The intention of the author of the paper is to contribute to the reduction of gap between great need for alternative work arrangements such as virtual teams and slow acceptance of the arrangements by managers in Serbian organizations. In that sense, the paper gives to the managers basic information and knowledge on

advantages and disadvantages of virtual teams. Also they may see a brief review of technologies that can be used by virtual teams. We hope that the research can help the managers to decide about virtual teams introduction and to make an overall evaluation of the potential of their organizations to cope with challenges and disadvantages of virtual teams implementation.

The paper also can support future researches which would be directed to methods of overcoming challenges and disadvantages of virtual teams implementation and methods of gaining advantages and benefits from virtual teams. A matter of particular interest is how many organizations have implemented virtual teams, which benefits are gained in the organizations and which problems in virtual teams implementation are solved in these organizations. The opinions of managers about virtual teams implementation should be examined in order to reveal reasons for slow acceptance of virtual teams in their organizations.

In order to meet the determined aims of this research, the paper is structured in six sections. After the introduction, the features of virtual teams are presented in the second section. In the third section, advantages of virtual teams are explained while disadvantages of virtual teams are analyzed in the fourth section. The fifth section is dedicated to ICT applications which can be used by virtual teams and the final section is concluded with implications of the research on future investigations of academic institutions and practices of business organizations.

II. FEATURES OF VIRTUAL TEAMS

Virtual teams became popular in the last decade of the 20th century due to improvement of internet technologies and expansion of electronic or virtual business. A team is defined as a small group of people with complementary abilities directed to the achievement of common goals and targeted performances. A virtual team is a group of people that can be geographically dispersed and that works together overcoming time, spatial and organizational barriers through ICT. The group of people primarily collaborates through computer and communication network connecting remote members in order to accomplish common goals. Members of virtual teams communicate face-to-face only occasionally and when it is necessary. They can be collected due to one problem resolution or engaged permanently in various

jobs. There are also virtual teams that permanently exist where members of the teams can be experts that are physically distant. These teams are flexible considering changeable conditions in business and work environment.

Internet and the other technologies in close relation with internet represent the base and support for virtual teams. Work outside office has been becoming usual for many people and they have opportunity to get updated information from place where it is created. It is hard to give some quantitative data on how many virtual teams exist in the world but number of internet users in the world can illustrate the acceptance of new technologies and potential for creation of virtual teams. The number of internet users in 2011 is over two billion [17] that means that there is the great potential for introduction of internet in everyday business and for creation of virtual teams. Many people have already accepted internet and its services and on the other side internet technology has been improving continually and becoming secure.

Virtual teams can do the same activities as the other teams – make decisions, exchange information, work on specific projects etc. These teams can include members from the same organization and the members of the teams can be connected to employees from the other organizations, such as suppliers and business partners. Members of virtual teams can be gathered to solve some problem for several days or can be brought together for a longer period of time to finish a project. Virtual teams contribute to accomplishment of work activities in an economical way especially when members of team are remote and they are not in the same building, city, country etc. In these cases, web technology is used to enable virtual teams to be effective and economic.

The most important feature of a virtual team is physical separation of its members. Communication and collaboration of members of the team depend only on information and communication technologies. Therefore in virtual teams specific technologic and organizational problems emerge and if they are not comprehended seriously, they can decrease substantially the productivity of individuals and the whole team.

Trust and identity are two relevant preconditions for success of virtual team. Identity is important for communication and loyalty of members to their team. Physical dispersion of team members makes difficult to create sound identity of team. Also, without close social interaction between members of team, it is hard to make trust between members. Without appropriate level of trust, it is difficult to make individual and collective decisions. Clear aims and roles are significant for productivity of all team members.

Virtual teams require reliable and efficient communication and collaboration technology which will meet needs of member of the teams. Thus virtual teams are supported by appropriate hardware and software. General hardware resources required for virtual teams are: personal computers, portable and wireless computing devices, communication equipment such as modems,

public communication networks and local computer networks. Software applications of virtual teams include groupware and workflow programs, e-mail applications, teleconference applications, instant messaging applications etc.

Management of virtual teams is the great challenge [7]. A leader of virtual team must take into account that team is composed of a group of various people which have to be managed. Since the members of virtual team often work on different locations, it is necessary to understand each other. In order to make members of virtual team collaborate in effective and efficient way, the leader of the team should:

- **Determine clear goals.** Every member of a virtual team has to comprehend and accept planned goals.
- **Define responsibility of the team as a whole and its every individual member.** Members of the team should understand a role of every coworker because the delay of work activities and the lack of responsibility of every member can impact on job of the other members of the team. .
- **Make appointment with every member of the team.** Regular online meetings should be followed by individual discussions with every member of the team. Such discussions enable members of the team to be informed with planned deadlines and goals. Also, in this way it is possible to monitor and control every of their planned work activity and task. Individual problems of members of the team which can be confidential in nature can be solved by these appointments and discussions.
- **Make sense of importance in every member of the team.** This sense can motivate members of the team to focus on action and obligations. The leader of the team should include the whole team in process of making decision by consensus.
- **Provide proper communication.** It is necessary to check communication lines with every member of the team in order to prevent disconnection in communication. All members of the team should be informed on events related to operation of the team in every moment.
- **Reinforce of relationships between members of the team and make friendly environment.** The leader must have skills and abilities for team building. By creation of opportunities for social events and friendly environment, members of the team get to know each other and make open communication.

III. ADVANTAGES OF VIRTUAL TEAMS

In order to meet requirements of an organization and achieve deadlines and planned goals, it is necessary to gain greater productivity of team as a whole. If virtual teams are well organized, they can accomplish greater benefits than classical teams regardless of physical remoteness of members of the teams [14] [15]. Advantages that can be accomplished by virtual teams are: increase of productivity, cost reduction, attraction

and retainment of value talents, stimulation of creativity and innovativeness and building of organization that better reacts to changes.

Increase of productivity. Working hours are not limited to 8 hours per day, but last 24 hours per day. In these 24 hours, every member of a virtual team organizes time on autonomous way which means greater flexibility. Flexible organizations with alternative and flexible working arrangements can achieve greater competitiveness on the market than traditional organizations. For example, a member of a team on the other side of the world can simply continue the activity which is started by the other member of the team that is guaranty that the activity will be done. Also, employees do not have to commute and time is not lost so that increases productivity.

Increase of market potential. By virtual teams, business can be spreaded and located all over the world so the market is developed in various parts of the world. An organization does business with various customers on many markets all over the world so the organization can become more competitive on global level.

Transfer of knowledge. Organization is not limited to one city and place in searching for workers. The best and skilled employees can be found everywhere in the world due to there are not spatial barriers and limitations. Every member of the team contributes to the virtual knowledge base which can be used by the other members of the team.

Cost reduction. Organizations enabling employees to work virtually reduce need for the procurement of additional equipment and office space. As more employees work outside the main office, savings for an organization are greater. Also, costs related to business trips and accommodation, renting and owning real estate can be substantially reduced and sometime totally eliminated. In addition, the great benefits of virtual teams can be gained by more efficient and flexible distribution of resources dependent on business needs on the global base.

Attraction and retainment of valued talents. Employees continually require more flexibility considering working conditions. Firms offering virtual work will attract and retain high talented people who particularly value that flexibility. These talented employees have a greater opportunity to control their time and to balance their work commitment with private life. They also have no geographical limitation because they can work wherever they want and live where is most convenient to them. Firms also can engage valued talents regardless of where they are.

Stimulation of creativity and innovativeness. In environment of virtual teams there are not geographical limitations and thus there are not restrictions who will be a member of a team or which tasks will be assigned to every member of the team. Creativity and innovativeness are better developed when the team is built taking into

account talents on global basis. Also, talents are better developed when individuals are faced with a global range of challenges and opportunities.

Building of organization that better reacts to changes. In virtual environment job is not limited on traditional working hours. Employees for whom flexibility of virtual work is important are readier to work over regular working hours. On the other hand, organizations are capable of responding to changing business conditions and can coordinate work between many business units in different time zones.

IV. DISADVANTAGES OF VIRTUAL TEAMS

Against these advantages, there are serious shortcomings of virtual teams [5] [11]. The shortcomings can make many problems in organizing of virtual teams and cause negative business effects. Shortcomings that a manager should consider carefully before establishing the virtual teams are: cost of establishment and maintenance of virtual teams, loss of efficiency, issues of organizational culture, sense of isolation, lack of trust, lack of focus and organizational changes.

Cost of establishment and maintenance of technological environment of virtual teams. For every member of virtual team, there are costs for procurement of equipment and software for mobile or home office and additional costs for every next year for software upgrade and miscellaneous supplies. In order to a virtual team be efficient there are following requirements: on-line materials which can be downloaded through network and printed; databases for discussion between members of team accessible from remote locations; centralized, indexed and automatized files accessible from remote locations, etc. As we already mentioned, ICT is most important element of virtual workplaces. When there is a lack of administrative and technical support for every member of team, ICT equipment could be out of function. Technical support should exist 24 hours a day, seven days a week or help desk should work from 8h to midnight.

Loss of efficiency. When expensive equipment or services are concentrated in one location, many users can access it and efficiency is higher than in situation when the equipment or services are distributed on many locations. Taking into account hardware and software costs for every member of virtual team, it is much cheaper and efficient to have all employees on one location instead on many different locations.

Issues of organizational culture. A virtual organization operating on global scene have to transfer its business politics and culture to distributed virtual teams. The teams are often distributed on many geographical locations belonging to different cultures. This could bring the eventual conflicts between business and national cultures, which could destabilize the organization. If members of virtual team have no more authority for decision making, the technology enabling their collaboration will be useless and the competitive

advantage related to fast response to market demands will be lost.

Sense of isolation. The greatest challenge in establishment of virtual teams is a sense of isolation. Since virtual work of every member of virtual team is mainly solitary, creativity and productivity could be reduced. Organization should obtain that a virtual worker is in contact with co-workers and managers and make opportunities for informal exchange of information that often leads to productive and creative ideas. Some level of social interaction with co-workers and managers is important in almost every job. Without the interaction, employees sense the isolation of main communication flows of organization. Isolation problem could be solved by monthly newsletters on news in organization which employees receive through internet. That reinforces the sense of social relationship. Also, annual and biannual conferences could be organized where all workers are gathered because of training, exchange of information, but more due to social interaction between them.

Lack of trust. The main element of success in organizing virtual teams is the trust that coworkers will fulfil their duties and behave predictably. The lack of trust can undo positive effects of every other action in organizing virtual teams, such as careful selection of employees for work in virtual team, training of managers and employees and management of business performances.

Lack of focus. In order to be successful, a virtual team and its members have to be focused on the work tasks. However there is a problem of how to keep focus of team when members of team never see each other. Also there is a problem for team leader how to lead projects according to plan, when people are often burdened by other more urgent duties. In order to avoid sluggishness in work, a virtual team must operate inside frameworks which are more structured than in case of traditional team. Aims, deadlines and responsibilities have to be more clearly defined than in case of a classical team.

Organizational changes. Proper operation of virtual teams requires organizational changes considering new methods of work. For the beginning, organization and its virtual teams have to make transition to methods of work which are more directed to results and which are dependent on new procedures and ICT. Every organization must evaluate its ability to manage these changes.

Lack of leadership skills. All managers are not appropriate for management of employees in virtual teams. Leaders in virtual environments should develop additional skills and abilities which enable them: to lead a team geographically dispersed across a region, country or globally and to encourage the team spirit between people who perhaps did not see each other. Without live contact with employees, leaders must listen carefully, communicate explicitly and interpret information receiving from employees in more sensitive manner.

V. INFORMATION AND COMMUNICATION TECHNOLOGIES OF VIRTUAL TEAMS

All virtual organization forms are based on ICTs. Computer network and many software applications based on it makes working environment for members of a virtual team and the environment replaces traditional office environment. The work of virtual team is not possible without intensive communication, meetings, telephone talks, numerous electronic messages, etc. Internet and the other communication technologies connect people on physically different locations and enable the organization and realization of virtual meetings. By realization of virtual meetings it is possible to overcome time and spatial distance. Members of a spatial dispersed virtual team working on common project must communicate and collaborate in solving of many relevant issues and it is possible only by ICTs [2] [3].

Basic ICT applications of electronic business provide network capability for communication, coordination and collaboration of virtual team members. These applications are:

- ❖ Teleconferences
- ❖ Videoconferences
- ❖ E-mail and voice mail
- ❖ Groupware
- ❖ Electronic whiteboard
- ❖ Instant messaging

Virtual teams can use the applications individually, but most effective way of communication is based on integrated solution that represents the combination of these applications. In order to obtain maximal productivity of virtual team, it is necessary to choose appropriate applications and technologies.

Teleconferences. People can arrange meeting by teleconference though they are on different locations maybe very remote from each other. Teleconferences enable members of a virtual team to make a simultaneous conversation by telephone and electronic-mail group communication software. Teleconferences enabling two or many people on remote locations simultaneous work on same document and data are called data conferencing.

Videoconferences. Teleconferences where members in communication see each other by screen display are called videoconferences. Videoconference communication is usually implemented through local computer network or wide area network that uses public telecommunication facilities, such as internet, telephone infrastructure, cable network infrastructure, etc. Presently, the well known form of videoconferences is webcasting enabling one way transfer of audio/video materials from server to clients. Audio/video materials are created and stored on server and a client then accesses to the materials.

E-mail and voice mail. E-mail enables users to send and receive electronic messages. Traditional mail box is replaced by electronic mail box that resides on some

server where e-mail messages are saved as while as it is received by a user. E-mail applications include text editor for creation of messages and have capability to add attachments in various form of files to the messages. Message can be sent simultaneously to many users so e-mail applications are appropriate for virtual teams. Also after reading of messages, members of virtual team can save the messages in form of textual files, remove or forward them to other e-mail addresses. On the other side, voice mail applications digitize voice message of sender, transfer it through computer network and store it on server. When receiver is ready to hear it, he/she can access it and the message is again converted to audio form.

Groupware. Groupware applications support a group of users working on common tasks, processes and projects. Groupware is collaborative technology that plays a key role in operation of virtual teams. Groupware applications support information exchange of group of users constituting a team and these applications are often called teamwork systems. The aim of the systems is to facilitate collaboration and coordination of team members and to integrate information in work processes that have been previously defined. The role of the systems is to automate the defined work flows.

Electronic whiteboard. This is a shareable application for drawing and writing that allows many users to collaborate on projects and work tasks by on-line modification of pictures and text. The application can be installed in network environment that enables videoconferencing. On electronic whiteboard, the content created by one user is emitted, while the other members of team are passive receivers of information.

Instant messaging applications. Instant messaging is a such form of real time communication between two or more people which is based on written text, voice or videoconferences. Instant messaging tools contain contact list and information on who is online. The most popular instant messaging tools are Google Talk, Skype, Windows Live Messenger and Yahoo! These tools are appropriate for virtual teams because of the following reasons: real time communication, content of communication can be saved, possibility to determine availability of user and feasibility of simultaneous communication with many users.

VI. CONCLUSION

In this paper brief overview of technologies for virtual teams, as well as advantages and disadvantages are presented. This paper gives conceptual framework for further deeper and more detailed research of advantages and disadvantages of virtual teams. This way it presents a starting point for future theoretical academic research, as well as practical implications on managers in organizations in implementing virtual teams in their work. Managers who plan to organize virtual teams can be introduced to basic knowledge on advantages and

disadvantages of virtual teams and which technologies can be used for supporting of virtual teams.

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Classification of Security Computer Systems and Networks and the Necessity of Upgrading the IS Security Tools

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Abstract - The development of information and communication technologies increased the number of abuses and criminal acts in the area of computer crime. In many countries around the world, with an information structure that is by its nature extremely vulnerable to these kinds of attacks, cybercrime is identified as one of the most destructive. Before the network administrators and professionals who deal with security aspects of IS set a difficult task of security threats informational structures and their users to a minimum. In addition to actively working range of professionals in the field of hardware and software in this one would be an upgrade and protect maximum IS-involved experts from the police department who are now increasingly faced with various forms of criminal acts in the area of computer crime. Varied and numerous potential threats and hazards that threaten information systems, especially those that have the character of criminal activity, clearly showing the need for building special protection of information systems upgrades highly sophisticated equipment. This paper deals with the key aspects of security of information systems and presents some concepts of protection of information systems.

I. INTRODUCTION

Varied and numerous potential threats - threats to information systems, especially those that have the character of criminal activity, clearly showing the need for building special protection of information systems upgrades highly sophisticated equipment HS. New methods of attack and fails to disclose the information systems on a daily basis. According to data taken from CERT (Computer Emergency Response Team), the number of reported security incidents in a period of fifteen years has increased almost 1000 times, and practically doubling every following year. The reasons for such a drastic increase in the number of security incidents are legion. In recent years, Internet access is simpler and cheaper, and as technology develops connections become faster and faster, so it is more difficult to analyze all traffic passing through such high-

bandwidth networks. In addition, the market is currently dominated by a small number of operating systems and finding vulnerabilities an attacker automatically receives a large number of potential victims that can be used to found a failure.

Accelerating development of technology markets the often incomplete and untested HS solutions that ultimately result in a large number of security vulnerabilities [2]. An example can be seen in the case of WEP (Wired Equivalent Privacy) protocol in wireless networks, where in just a few months after the release of the protocol showed a number of tools to exploit its flaws. In addition, the popularization of the Internet information about new failures are trivial and rapidly spread among a large number of people, and purchasing tools for a variety of attacks on information systems is reduced to simply enter a keyword into Google and download ready-made tools from one of the many hacker sites. For this reason, the knowledge required for the successful execution of an attack on the information system becomes irrelevant factor, and an increasing share of the population, make up the so-called attackers. script kiddies, attackers using ready-made tools without detailed knowledge of them, or the failure to exploit.

II. CLASSIFICATION OF SECURITY THREATS

IncurSION is any unauthorized attempt to Information (information system) access, manipulate, and that such changes or destroyed, or that the system is so unreliable and unusable. Expressions attack, intrusion incident and are often used interchangeably in the literature of computer security, which can be quite confusing. For the purpose of classification of real web of incidents, the difference between the two terms must be made. The attack was defined as a single unauthorized intrusion attempt, regardless of success, and the incident is defined as a number of attacks that can be distinguished from other incidents because of the uniqueness of the attacker and the techniques used and the frequency. The concept of classification and attack components shown in Figure 1, which presents a simplified path that an attacker has to go to fulfill their intentions. To be successful, the attacker must find one or more paths through which they can

connect, preferably at the same time. This approach suggests that computer security system prevents attackers to achieve their goals through a single connection through the six steps show.

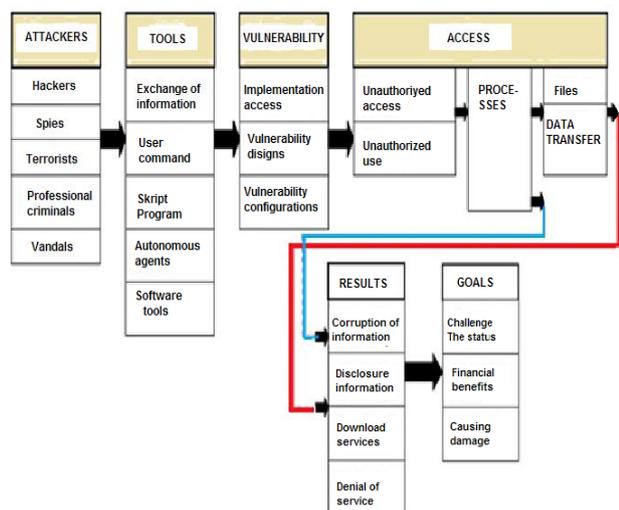


Figure1: The concept, classification and components of attack on computer system

The attackers and their goals

Attackers use a variety of methods to achieve various goals. They were divided according to who they are and what their objectives. There are five categories with respect to what their intentions:

1. Hackers - break into computers because of the challenges and status;
2. Spies - break into computers for confidential information;
3. Computer terrorists - break into computers to cause chaos with the intention to mislead;
4. A professional computer criminals - break into computers for financial reasons;
5. Computer vandals - break into computers in order to cause damage.

These five categories of attackers and their four categories of the plan, as shown in columns to the far left and right side in Figure 1 These columns are used as the two extremes of operating a series of attacks on computers and computer networks. This division is based on a publication issued by John D. Howard called Security Incidents on the Internet.

Access to the IS

In order for the attacker to carry out its aims, must get unauthorize access to a computer or network, or if you have authorized access, this approach must be used in an unauthorized manner. Unauthorized access is used to process the data and files that are going through the process. This is shown on the right side of the access block (Figure 1).

Vulnerability IS

In order to access the desired process, the attacker must use a network or computer vulnerability, an omission that allows unauthorized access. The vulnerability may stem from three things:

1. Implementation Vulnerability - The design is satisfactory, but a mistake was made in the implementation of a software or hardware;
2. Designer vulnerability - vulnerability is in the design, and so in the case of perfect implementation of software and hardware holes exist;
3. Configuration Vulnerability - The system is configured so that it is vulnerable, such as system accounts with standard codes, open permissions for creating new files, and vulnerable services enabled.

What happens after raid

Between the attacker and gain access intent, summarizing the results of the attack. At this point, the attacker was able to gain access to the required processes and data that are in the flow. The attacker is now free to use this approach to changing data, deny service to, to get the desired information or to use the services. Figure 1 show the results of the attacks, which are defined as:

- Corruption of information - any change of data stored on the host computer or data flow on the network;
- Disclosing information - dissemination of information to anyone who is not authorized access to that information;
- Download service - the unauthorized use of computer or network services without degrading the service to other customers;
- Refusal of service - intentional degradation or blocking of computer or network resources.

Tools intrusion IS

Last and most important connection that needs to be done in a number of leading attackers to implement his plans is tools of attack. This is also the most difficult connection to make because there are a variety of methods to exploit the vulnerability of computers and networks. When you make a list of the authors of the attack methods, often make a list of tools. Approach used here was required to establish the following categories:

- **Exchange of information** - Striker comes to the details of any of the other attackers (such as a hacker

bulletin board) or from people who were attacked (social engineering);

- **User control** - Forward command entered on the command line or a graphical interface. An example is entering Unix commands via telnet or ssh connections;

- **The script or program** - run scripts or programs with a user interface to exploit the vulnerability. Example of a shell script to utilize software bugs, Trojan horse to the logging program, or breaking codes;

- **Autonomous agents** - Forward run a program, or programs, which operate independently of the user to investigate the vulnerability. Examples are computer viruses or worms;

- **Software tools** - Attacker uses packaged software that contains scripts, programs, or independent agents that use vulnerabilities. The example is an internet programming tool called a root kit or development environment for exploitation by the name of Metasploit. [3]

Except for the assault, information exchange, and the categories of data which are tapped, each category can contain tools and other tools inside. For example, software tools include scripts, programs, and sometimes independent agents. And when using software tools, scripting and programming categories are also included. User controls should also be used to run scripts, programs, independent agents, software tools, and distributed tools.

The structure of the attack is drastically changed over time. According to CERT, ten years ago, most of the reported incidents have been included in reports of adverse effects of the virus, guessing user passwords to various search methods (Brute Force), and the use of well-known vulnerabilities in systems. The growing complexity of information systems and dramatically increasing the number of security vulnerabilities. Today, the majority of reported attacks CERT are various types of network attacks ranging from simple stealthy port scanning (Stealth Port Scanning) to the DDoS (Distributed Denial of Service) attacks and spoofing packets (packet spoofing). At a time when almost every computer connected to the Internet, and for all the reasons stated above, the development of network security and safety solutions for defense against network attacks are one of the fastest areas developed throughout the computer industry. A special role in this process is the development of tools for the defense of vulnerable network services.

In parallel with the development of various methods of attack on information systems were developed and defense mechanisms and techniques. One of the first and probably still the most commonly used methods of defense is the use of a firewall.

A firewall is basically a software or hardware that is running the appropriate software that acts as a filter pack and has to control network traffic between different zones of trust which can be selectively prohibit or miss traffic towards certain groups of computers. The most common examples are the local trust area network, which has the highest degree of trust, demilitarized area (demilitarized zone) with a lower degree of confidence and internet area with the lowest or any degree of confidence. The first implementation of the firewall was static and did not follow the state of the connection (stateless packet filter), so they could only block the traffic, depending on the network address and the access door. Today, this approach is usually less frequent and is used firewalls that can monitor and balance connection (state full packet filter). Monitoring the state of connection allows you to create much more complex rules because each connection and joins one of the possible states. Possible states for example: new, established, connected (related) and the like. This technique allows better functioning firewall problem with services like data transfer protocol FTP (File Transfer Protocol). The increasing need for such solutions appeared after the introduction of newer networking technologies such as CIDR (Classless Inter Domain Routing) and NAT (Network Address Translation).

The main disadvantage of firewall protection is that most of these solutions to the network (L3) and transport (L4) layer which can leak or inhibiting traffic only depending on the data available on these layers. Modern methods of protection and traffic analysis require the higher layers of the network, especially at the application (L7) layer. For example, a packet arrives at the client and contains harmful code that would allow an attacker to access the operating system shell (shell code), firewall will not be rejected because they are on the network and transport layer are only available information about network addresses and access ports and Firewall cannot know anything about the contents of the package (payload). It is obvious that for much greater control of network traffic needed a solution that would among other things be able to analyze the contents of the package and on the basis of that information to decide whether the package will be missed or dismissed. One of the most commonly used security solutions are-and honey pot. Honey pot and are computers that are located on the same network as the actual computers, and whose main purpose is to deceive the attacker thought he was doing the actual server in the network. The goal of this technique is to gain time and know how to use an attacker to perform a break-in. Usually there are plenty of close honey pot address at the real servers and running services that are analogous to (or at least approximate) service running on the server with the only real difference is that the security settings on it somewhat less than the actual server. But I honey pot should be isolated from the real server in the sense that the attacker after they occupy the honey pot does not get the opportunity of continuing attacks on other computers in the network.

The importance of the implementation of intrusion detection systems

Intrusion detection is required in today's computing environments because it is impossible to be in step with current and potential threats and vulnerabilities in our computer systems. The environment is constantly changing, evolving, improving, especially with today's technological advances and the Internet. To make matters worse, the potential risks are also evolving, and new culverts are constantly appearing. Intrusion detection systems are tools that should help us to protect you from the dangers of such a development environment.

The vulnerability that was thought in the previous section is some weaknesses in the system. Figure 1 shown that vulnerabilities can be (design vulnerabilities, vulnerability, configuration, vulnerability implementation). These vulnerabilities can be used in order to put an incursion into the system and given appropriate privileges in the system. Each new generation technology product, there is a new operating system, a new program or even a new type of mobile phone brings with it certain imperfections, and errors in the implementation of certain omissions. The possibilities that the exploitation of these vulnerabilities are also constantly increasing. In the worst case, the intruder can cause a drop in production, cessation of operation of the system, the loss of critical information (for example, those related to access to finance company) or the production of bad relationship with a company, or even the judicial system.

Intrusion Detection System

Intrusion Detection System (hereinafter referred to as Intrusion Detection System IDS) is an application that detects security threat to computer network or in the case of recognition of danger in some way makes it clear that there has been a breach of security. Average IDS consists of three functional units:

1. Sensors ("eyes" of each IDS through which captures the level of traffic on the network or a computer system).
2. Console ("control arm" IDS monitoring and control) and
3. The central system ("soul" IDS security system that records the sensor detects events, saves them in a log or on the basis of a system of rules generates warnings).

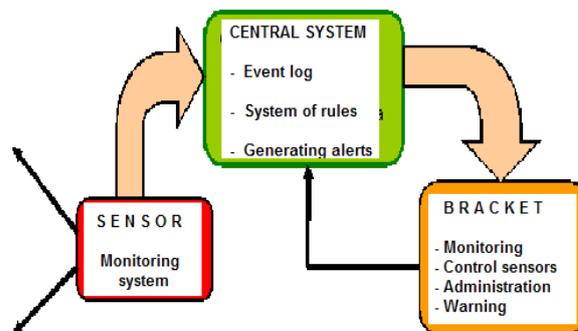


Figure 2: Basic components of IDS

We'll make a brief summary of the gains that gives us IDS to improve security:

1. Identifying attack. Identifying the main purpose of the attack IDS. IDS should be able to tell us, for example. Exploit a network that attacked the security of the system in question.
2. Set security policies for local networks. IDS can serve as a tool for monitoring the internal network as well as any behavior within the network that does not agree with the rules of the organization (eg, a worker uses MSN messenger even though it is prohibited by the rules of the company, with the IDS-enabled quick to recognize this behavior)
3. Track attack. IDS have a very important role in the post-attack analysis. Should provide clues to the intruder came from, where it came from and what he has done, and all that could possibly be used in initiating legal action against the invaders.
4. Justify the costs. IDS can provide information about how good the current Firewall (if you need a software or hardware upgrade) and how many people can get to the internal network services (security problems, additional staff for the network security, the rationale of system security sector wages)

Classification of intrusion detection systems and concepts

Intrusion detection systems or IDS can generally be broken down as follows:

1. Network Intrusion Detection System NIDS. Can analyze network traffic (packets traveling cables between computers) and compare the fingerprints to the database security threats. NIDS has the following tasks:
 2. NIDS uses a network card set in promiscuous (hereinafter jointly) mode in order to catch packets that travel in different media and protocols (usually TCP / IP).
 3. Generates warnings about the attacks in real time,

4. Generate logs that can help in the analysis of the attack after the attack had already occurred.

A typical example of a NIDS is **Snort system**. [9]

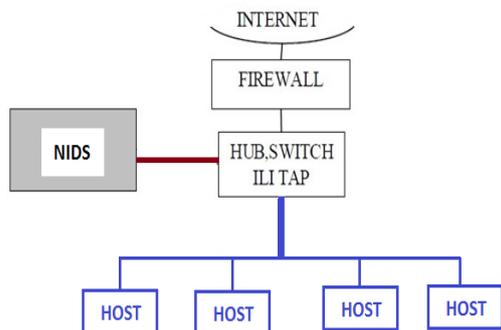


Figure 3: Network-based Intrusion Detection System

Host Based Intrusion Detection System – HIDS are installed as agents on the host machine. Can analyze the system and application log files in order to identify activities that resemble the raid. HIDS has the following tasks:

- HIDS monitors incoming network traffic to a computer in order to detect attacks, while using anomaly detection based on or signatures. Usually, the network card on the system is not in the same fashion.
- HIDS examines system logs for suspicious events, such as. Multiple attempts at logging disabled.
- HIDS checks the integrity of files on the system. Integrity is evaluated in terms of whether the file was modified. Checking Integrity also includes checking whether the files are created or deleted.

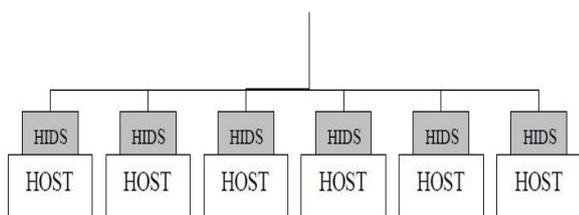


Figure 4: Host-based Intrusion Detection Systems

Intrusion Detection System Distributed – DIDS has the following characteristics: it is contained by a NIDS, HIDS, or both systems, sensors are located throughout the network and send reports to a central control station, central management station contains a signature intrusion and sends it to the sensor, if necessary, the use of encrypted VPN connection between the control station sensors. [6]

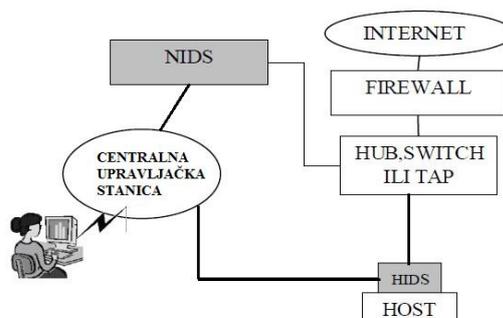


Figure 5: Distributed Intrusion Detection Systems

Before we explain the basic concepts of system intrusion, we explain several key concepts directly related to the ways of intrusion detection systems:

False alarms - positives

Alarms are false alarms generated by the intrusion detection system that thinks it has detected a valid attack although this is not the case. False alarms are problematic because they can create a mask alarms distract from the real attacks. False alarms occur when the system generates an alarm to detect the following events:

- network traffic that looks similar to a raid but did not attack;
- actual invasion that attacks a system that is not monitored by IDS - Honey pot.

There are many reasons for the occurrence of false positives, and one of the principal that a signature or with which the IDS system intrusion detection compares fingerprints of traffic, too general.

Attack missed -false negatives

Missed the intrusion attack by IDS failed to detect and therefore did not alert based on it. There one more reason why intrusion detection system can attack fails:

- IDS has no fingerprint attacks against its database of signatures,
- IDS is currently overloaded and skips some packets,]
- IDS are 'fooled' by the attacker able to successfully avoid detection system. [7]

The main types of detection used by intrusion detection systems:

- Signature detection, a signature is a pattern that IDS compares the contents of a package of policies known attacks. Usually it is a typical bit and pieces of information that should be reviewed by the IDS incoming network traffic and recognize it as a 'bad' traffic. A group signature used by an IDS signature database (Signature base). Detection of the signature is most widely used types of detection IDS and Snort are one of the tools that use this type of detection.
- Anomaly detection, IDS using anomaly detection by operating on the principle that learning to look "normal" network traffic and then create alert if you

see something that is different from the images of normal traffic. Unfortunately, much of that new or otherwise can be marked as "abnormal" traffic to IDS configured properly in this case can be low in terms of missed attacks but also very susceptible to false alarms.

III. IDPS AND IPS INTRUSION DETECTION SYSTEMS

We can conclude that all the major companies, state institutions (military, police, customs, etc.) And other organizations concerned about the security of their data using a hardware firewall systems, or, more recently Intrusion Prevention Systems (IPS) also known as Intrusion Detection and Prevention Systems (IDPs), i.e. systems for the prevention and detect intrusion. In figure shows the logical scheme of protection with Cisco Pix Firewall (Figure 6).

The picture shows the logical schema with one of Cisco solutions for data protection using hardware firewall or Intrusion Prevention System Systems, abbreviated IPS[10].

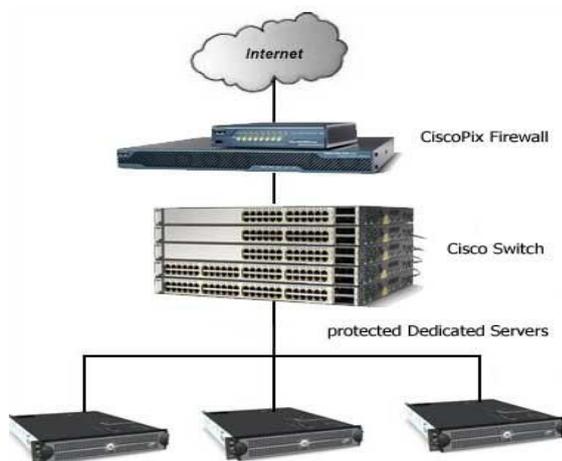


Figure 6: Logical scheme with Cisco Pix firewall

Firewall protection is an important factor in firms and the selection of a firewall should be taken into account. When commissioning a firewall, as expressed by system engineers, everything is closed, which means it is the responsibility of the man to be configured firewall or port will be released. Today's firewalls are usually a combination of routers and firewalls (Figure 7).

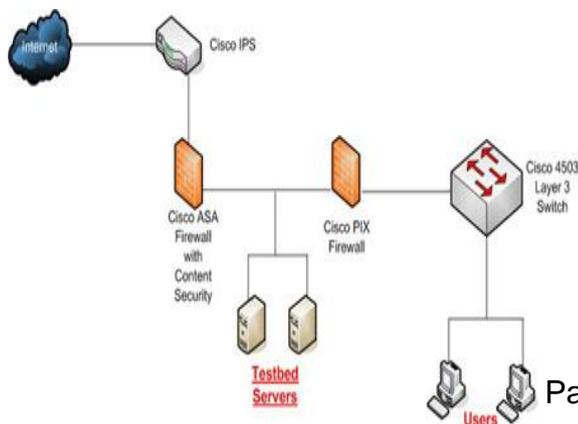


Figure 7: Logical scheme with Cisco Pix firewall

Systems for the detection and prevention of intrusions are network security appliances that monitor network and / or system activities from malicious activity. The main functions of intrusion detection systems (IDS) are identifying malicious activity, log information about the activities, and possible attempts to block / stop activity, and report on activities.

Intrusion prevention system (IDPs) is considered extending IPS. When IDPs are simultaneously involved on both monitors (monitor detection and prevention Monitor) traffic on the network and / or system activities for malicious activity. The main difference compared to the IPS is that it is possible actively preventing (blocking) system intrusions.

CONCLUSION

Given the number and variety of potential threats that endanger information systems, especially those that have cracker fraud, call for the construction of information systems protection. Intrusion detection systems are recent trend of tools for security of computer systems and computer networks. Time will prove that the security of a modern business environment can not be a single tool (often just a firewall), but also the tools that have the ability to recognize the details of the contents of network traffic. Of course, it should be noted that the major role of security to people who will have their ability to prevail in today's fast paced developments in order to security tools, and tools and methods for security breaches. Internet has become a place of great exchange of knowledge and experience from both the good and bad intentions, and it is now causing the number of security threats have a steady climb. Snort is one of the first intrusion detection systems, which developed partly merit Internets. This shape the evolution of knowledge, able to adapt to today's Internet age has significantly contributed to the detection system becomes one of the main tools of the many tools that exploit loopholes in the implementation of the numerical application and software manufacturers that often more about money than quality quickly put on the market. In this work we have shown how to implement such a system in a network environment that, with all its hardware and software requirements and how to use it to identify security breaches and protect information systems.

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Smart Home Technologies in the Cloud

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Abstract - Cloud computing is making its way towards use at home. This paper presents a cloud for smart home. We present review of technologies for smart home and give an integrated cloud-based energy- and carbon-efficient architecture. It consists of smart outlets, smart light switches and lighting, integrated network for the control of energy consumption, centralized control of the smart home, audio and video communication system, digital television and entertainment devices.

I. INTRODUCTION

In the recent years, cloud computing has emerged as a powerful alternative model for enabling on-demand access to a shared pool of configurable computing devices. It works on a client-server basis, using web browser protocols, providing computation, software, data access and storage services. It provides server-based applications and data services to the client, with the result being presented on the client device. Various devices may log into the cloud – personal computers, mobile phones, tablets, servers, etc.

According to the recent study, cloud computing can reduce the energy consumption [1]. It may also lead to massive carbon emission savings – predicted to be 85.7 million tons annually by year 2020. Cloud computing could lead to a 38 percent reduction in worldwide data center energy use by year 2020. Carbon profit may be reduced as much as 90 percent for the smallest and least efficient businesses.

There are some reasonable doubts in energy efficiency of cloud computing. Baliga, Ayre, Hintor and Tucker [2] gave an analysis of energy consumption in cloud computing. They considered both public and private clouds and included energy consumption in switching and transmission as well as data processing and data storage. They showed that cloud computing can enable more energy-efficient use of computing power. However, under some circumstances cloud computing can consume more energy than conventional computing on the personal computer (PC).

Zhu, Luo, Wang and Li [3] presented the principal concepts of multimedia cloud computing. They addressed cloud computing from multimedia-aware cloud and cloud-aware multimedia perspectives. To achieve a high quality of service for multimedia services, they proposed

a media-edge cloud in which storage, central processing unit and graphics processing unit provide distributed parallel processing.

Even though it started as a commercial solution offering computing resources and services for renting, cloud computing is slowly making its way towards private use at home. Encouraged by the results of volunteer computing projects and the flexibility of the cloud, Cunsolo, Distefano, Puliafito and Scarpa [4] developed a computing paradigm they named Cloud@Home. They see it as a generalization knocking down the barriers of volunteer computing, as well as the enhancement of the grid-utility vision of cloud computing.

Clouds mostly offer storage and multimedia services. We believe that the services cloud can offer may be extended to offer control and storage services to the smart home. In that context, we propose cloud-enhanced smart home system. We present the review of some of the current technologies used in the smart home and give a proposal for an integrated cloud-based architecture which would offer cloud services to all the mentioned technologies working together. The goal is to design a more energy- and carbon-efficient system for home use.

The rest of the paper is organized as follows: section 2 presents the overview of the proposed home cloud. Section 3 explains cloud components in more detail – smart lighting and outlets, intelligent home networking system, smart home control system, audio and video communication system and entertainment devices. Section 4 gives some concluding remarks.

II. CLOUD OVERVIEW

Fig. 1 on the next page presents the overview of the proposed smart-home cloud model. The proposed cloud consists of the following servers:

- Smart lighting and electric outlets,
- Intelligent home networking system,
- Smart home control through digital TV,
- Audio and video communication system,
- Entertainment devices.

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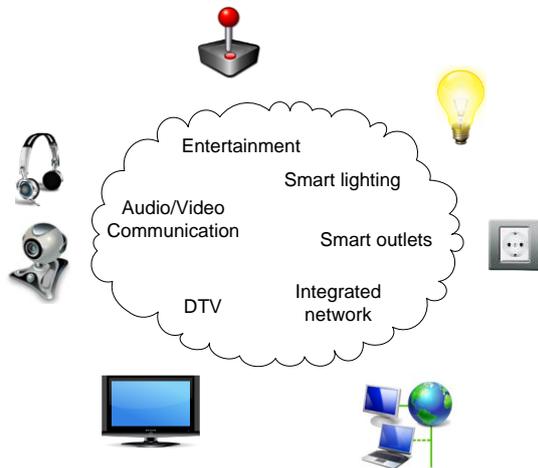


Figure 1. Cloud overview

III. CLOUD COMPONENTS

A. Smart Lighting and Outlets

Smart lighting and outlet solutions bring additional functionality and comfort compared to standard on/off switches and potentiometers [5]. In a smart home, users can control lights using the remote control and select the desired light intensity for each light bulb. Furthermore, it is possible to program lights to be at a desired intensity at a given time in the future. The servers for smart lighting can be accessed over the internet to provide remote control even outside the home. The same can be achieved with other simple home appliances through the use of smart outlets. Cloud services for smart lighting and outlets may include storage of lighting profiles and history of device operations for devices connected to smart outlets, as well as centralized control as discussed later.

Smart outlets and light switches can be turned on, switched off and dimmed up or down manually by using control interface or automatically by using patterns defined in the scripts. With a support for Zigbee and TCP protocols, the HC is able to receive the information about the electrical characteristics of the devices attached to the outlets, to process them and save the historical data to the local or remote SQL database. By using the attractive and easily accessible web UI, users are able to monitor consumption or to set up energy saving modes by choosing one of the available scripts.

Smart outlets can be used to extend smart power control to home appliances other than lighting. With them, all electrical appliances within the home can have smart control and be turned on or off remotely, by a user using the application on their smartphones or computers.

Fig. 2 presents an example of smart outlets and smart light switches used in the smart home.

Fig. 3 presents the achieved energy savings in the experimental house (160m²) with lights “eco mode” started. [5] The test was performed during two working days in the house with four-member family (two adults, two kids).



Figure 2. Smart outlets and smart light switches

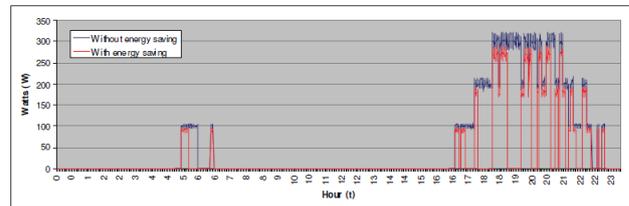


Figure 3. Energy savings of smart outlets

B. Intelligent Home Networking System

An intelligent home networking system [6] provides monitoring and controlling of residential energy. It consists of wirelessly-controlled smart power extension cords, remote controllers, wireless PIR sensors and home energy controller. The system is based on ZigBee 2.4 GHz wireless network protocol and is easily configured and managed as a residential smart grid. This system can be integrated in the cloud which would offer storage of energy consumption in the home and control for wirelessly-controlled home devices. In such way the system will be able to follow energy consumption in real-time and share the data with a smart meter installed in the home. There are initiatives [7] to connect smart meters at national level and use secured cloud for storing energy usage of each home. Contrary to this macro level, the intelligent home networking system provides the micro smart grid option, supporting further energy savings reported in [1]. Fig. 4 presents an overview of the intelligent home networking system.

C. Smart Home Control

Digital television and set-top boxes can be extended to provide control over home appliances in a smart home. References [8]-[9] provide examples of such systems. Remote control which was used to control television set or set-top box can now be used to control all home appliances. Intelligence and awareness is achieved with a support for execution of recipes - prepared scripts that define timely actions and respond to triggers obtained from sensors. The main aim is to allow the interaction between interactive TV applications and the controllers of the in-home appliances in a natural way. This unit would offer centralized control for the whole cloud. Cloud may also offer storage services for digital TV and other multimedia data available in a home.

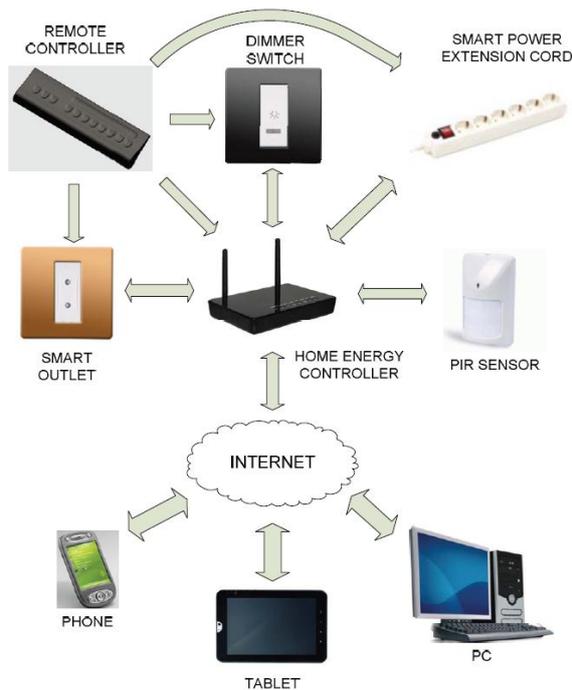


Figure 4. Intelligent home networking system

D. Audio and Video Communication System

An integrated audio and video communication system can be connected to the cloud to add full-duplex hands-free videophone functionality in the smart home [10]. It consists of a digital camera and microphone array which are connected to the TV set through the High Definition Multimedia Interface (HDMI). It provides excellent sound quality via TV loudspeakers and simultaneous watch of the TV broadcast. Microphone array allows for suppression of the existing sound from the TV broadcast. Storage of the history of audio/video communications can be offered by the cloud as well as access to the unified contact list.

The audio and video communication system has the following main hardware components:

- central processing module,
- digital camera for video input,
- microphone array for audio input,
- remote controller with voice-call interface,
- support for typing text messages.

The main software components of this add-on device are:

- video decoding,
- On-Screen Display (OSD) support for videophone,
- remote control handling,
- display control,
- sound control.



Figure 5. The prototype of the back side of the proposed videophone device

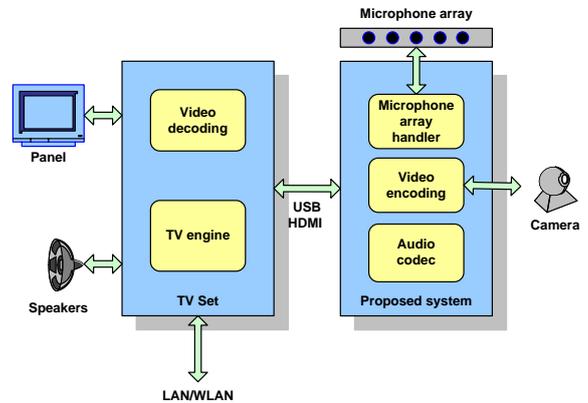


Figure 6. System overview

Fig. 5 presents the prototype of the back side of the audio and video communication system.

Fig. 6 shows the overview of the system. The main hardware/software components of the system are highlighted. The device is connected to the TV set via USB interface. TV set connects to the panel, speakers and network interface - Local Area Network (LAN) and Wireless LAN (WLAN). Camera and microphone array send input data to the proposed system for processing.

E. Entertainment

Entertainment devices can also be incorporated in a cloud as the storage needs for games increases at a high rate. User awareness kit [11] can be used as an add-on device with a variety of consumer electronics devices. As a result, host device would be able to anticipate user actions and adapt accordingly. It combines sensor inputs (passive infrared sensor, microphone array, time of flight camera) with behavior models based on system attentiveness and user-system interference concepts, to provide information about the users to its host. Gaming devices can be added to the cloud through PC or a console connected to the digital TV set and gaming experience can be improved with the use of the aforementioned user awareness kit and gaming accessories.

IV. CONCLUSIONS

This paper presented a review of cloud-enhanced smart home technologies. The proposed cloud covers basic requirements of a smart home – smart lighting and outlets, intelligent network, digital television, audio and video communication and entertainment. Servers for each of these applications work in a cloud environment, therefore saving energy and providing a more ecological-friendly solution.

Many households are already equipped with flat screen TV receivers and users are ready to try new products. The Internet-connected TVs started to take off in TV markets beginning of 2010, and there is no doubt that soon every TV that ships will have a built-in Wi-Fi, webcams and microphones.

Cloud is just beginning to enter private use in homes and provides an efficient alternative to integration of all technologies in a smart home. The future work will consist of adapting the mentioned system for optimal performance in the cloud environment as well as designing new systems which will connect to the same cloud with the goal of integrating the whole smart home in the cloud. The future development of the proposed systems in the cloud aims to grow them into competitive products in the respective markets.

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Using Wireless Sensor Networks in Converting Buildings into Intelligent Buildings

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Abstract - Converting „classic“ buildings, already built and in use, into intelligent buildings represent big problem and challenge, sometimes impossible. Using wireless sensor networks this process, at least in certain aspects, is greatly simplified. Even in the buildings being built as intelligent, this approach enables greater functionality to classical approach in certain areas.

I. INTRODUCTION

Intelligent buildings as a scientific area are present since mid 1970's, when X10 standard appeared. Originally, interest for this area was caused by the desire for automation of certain functions of residential and office building and factories – whether in order to increase comfort of its inhabitants/workers or to increase productivity and functionality of factory plants. By the advancement in electronics and its miniaturization, the idea of the automation of space we live or work in became more present and more realistic. However, by the end of 1990's and the beginning of 2000's, focus on automation of buildings changed from comfort and functionality to energy efficiency.

Although the productivity of its occupants, when we are talking about office space, is still very important element during the design of those buildings, today, energy efficiency, is most important factor. Savings are achieved on various ways, but mostly by checking for presence of people in offices and by adjusting lighting, heating, cooling, ventilation, etc. Some studies showed that we can increase energy efficiency by 40% by using smart technologies [1].

By making buildings “intelligent”, we are also significantly increasing its market value. The difference in the value between “conventional” and “intelligent” building greatly exceeds investment required to make a building intelligent, which makes this kind of investment very attractive to investors, and not only to end users.

From all of the above, it is clear what part intelligent buildings are playing in modern life and work, as well as what are the reasons for additional investment during the design and construction of those buildings. But, the question is what to do with buildings that are already in the exploitation, and do not have this functionality? Is there a way to automate those buildings, which is cheaper

and simpler than moving out its inhabitants and performing complete restoration/redesign of the building, as this approach of converting “conventional” building that are already in exploitation into “intelligent” ones is very expensive and unprofitable? Owners or users of such building can affordably automate it only partially using energy grid, laying new cables and wireless communication technologies. In practice, this is usually limited to access control, surveillance and lighting control.

In this paper, the authors propose using wireless sensor networks in order to achieve higher level of automation of already built buildings, with main goal of increasing energy efficiency.

II. WIRELESS SENSOR NETWORKS

Wireless sensor network (WSN) is the wireless network consisting of spatially distributed autonomous devices which use sensors for cooperative monitoring of physical conditions in specific environment such as temperature, pressure, vibrations, movement, etc. [2].

Main properties of this network are, apart from the fact that they are wireless, miniaturization, possibility of mutual communication, low energy consumption, slow communication speed – caused by relatively low bandwidth and need for large device autonomy, which is usually battery powered.

Although those networks are originally designed for military use, the idea was quickly adopted for non-military use, so wireless sensor networks became very popular subject recently. The application is very broad, from monitoring environmental parameters, either outdoors or indoors, monitoring the parameters of rotating machinery, etc.

This technology is currently still in the process of development, where the main challenges are further miniaturization, longer power autonomy, adopting a standard communication protocol, which would allow the sensors for different purposes to communicate among each other, thereby effectively increasing the range of communication of such networks. While wireless sensor networks are not yet a mature technology, there is a large body of experimental and practical applications today. This technology is certainly one of the technologies for

the future, and no doubt an essential part of the future of intelligent buildings.

III. INTELLIGENT BUILDINGS

A. Definition

One of the basic definitions is that intelligent building provides an appropriate, effective and nurturing environment in which an organization can achieve its business objectives. Intelligent building technologies are means that allow this [3]. However, it is often encountered the other, more recent definition by which the intelligent building is the one maximizing the efficiency of its users and enables efficient management of resources with minimum cost of exploitation [4].

B. Components

Most often, but not exclusively, there are controls for HVAC (heating/ventilation/air conditioning), access, lighting and elevators in intelligent buildings. Some of these systems, in order to be installed at a satisfactory level - a level that ensures maximum energy saving, while providing maximum comfort and efficiency for the residents/users of these premises, require special installations, whether in terms of electrical installations, water pipes or ventilation.

Generally, these structures are characterized by (Fig.1.) a large number of sensors, actuators and central logic (BMS - Building Management System), which is depending on the information on inputs (sensors) and the control logic manages the devices on the outputs.

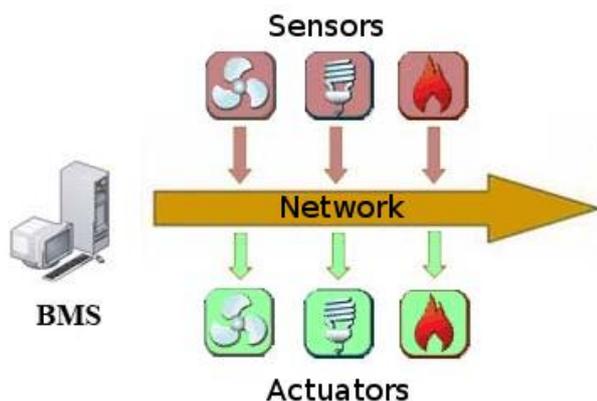


Figure 1. The distinctive appearance of the installation of intelligent building

C. The conventional buildings

When analyzing the figure 1 and comparing it with the situation in conventionally constructed buildings, it is clear that in this case we can find lower part of Figure 1 in them - there are devices for HVAC, lighting, etc. and they are all connected to each other through electrical power grids. This very fact makes it easy to convert a part of such a building in an intelligent building, using one of the

numerous protocols for communication and control of devices using electric power networks, as already mentioned X10. In other words, there is already a way of controlling these devices by the BMS, and to automate the building we need input information - sensors that will read this information and a medium for the transmission of data from sensors to the BMS.

IV. USING WIRELESS SENSOR NETWORKS IN CONVENTIONALLY CONSTRUCTED BUILDINGS

By its very definition, a WSN is a perfectly adequate solution to this problem. First of all, it is a sensor, which is exactly what we are missing, still, the wireless so no cables needed to transmit data from sensors to the BMS. In addition, WSN are powered by batteries - they do not need external power source, and have a long period of autonomy. The use of these particular properties, which are also the main characteristics of wireless sensor networks enables their use for converting conventionally constructed buildings into intelligent buildings.

The authors of this paper propose a system in which wireless sensor networks would be used as a sensor part of intelligent building, when through such network data on temperature, humidity, lighting conditions, etc. would be transmitted to the BMS, which could, on the basis of these data, control the various actuators in the building.

In addition to already mentioned advantage of easy installation, using this technology, we can achieve much higher resolution of sensors (their bigger density in a room) than it can be achieved with standard sensors. This advantage is important in the design of new buildings that will be "intelligent" from the very beginning, and not only in converting the buildings constructed using conventional methods into the intelligent. With higher sensor resolution we can, for example, achieve far better control of micro-climatic conditions in a room - monitoring temperature, humidity, etc., not only in one or two places, but by far the greater number of locations in a room.

One of the problems that this system would certainly meet is small signal range of individual nodes of such networks in buildings. This problem would be solved by setting up wireless gateways that would receive data from the network in a specific room (or rooms), and then forwarding them to the BMS. Locations of those gateways would be determined experimentally and they depend on the propagation of the signal inside the building. One of the advantages of wireless sensor network nodes is that they cooperatively transmit information, regardless of which type of sensor is connected to the node (thermal, hydro, etc.), effectively increasing the range of a network.

Another problem is the period of autonomy of individual nodes - battery life. This problem is common in wireless sensor networks, and as such will always exist. Extension of the autonomy of individual nodes is achieved by developing energy-efficient communication protocols, as well as progress in the development of battery technology.

The third obvious problem is the cost of a network node that is currently quite high, ranging from 100 to 300 U.S. \$ [5], depending on the type of sensors that are part

of that node. However, it is quite realistic to expect that due to further progress in technology and mass production of nodes their cost will fall, especially since the wireless sensor network is the technology whose development is given very serious attention, both in terms of reduced cost of production, and by the extension of the autonomy of the individual node power.

V. CONCLUSION

The authors believe that the proposed solution is promising both for implementation, as well as for further research and promoting these technologies. Opinions are that these two technologies - intelligent buildings and wireless sensor networks are increasingly appearing together, not only for the purpose of upgrading the existing conventionally constructed buildings, but as functionally complementary technologies that will be implemented in the facilities designed and built as

intelligent from very start. Intelligent buildings, for now rarely built in the region, as a means of achieving greater energy efficiency and greater efficiency of workers, will soon become a common sight in our region.

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Business Process Orientation and Change for Implementing Integrated E-Business Solutions in Companies in the Republic of Macedonia

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Abstract – In order to survive and become more competitive in today's complex, dynamic and global environment, companies and their managers are forced to search for new ways of managing e-business initiatives. Companies are pressured to become more flexible, fast responding and customer oriented. To achieve these goals they should become process oriented. Business process orientation and process thinking help management to leverage the use of the information and communication technologies and the Internet, and hence to implement e-business with a greater success.

Hence, the goal of this paper is to reveal the meaning and importance of business process orientation and business process change when transitioning to e-business. The main research question was to understand the potential benefits of business process redesign (BPR) projects when implementing integrated e-business solutions and their impact on competitiveness of companies.

To achieve the goal of the paper, an interview with managers of Macedonian companies was conducted based on the previously prepared questionnaire for business process orientation, business process change i.e. business process redesign, in order to confirm (or reject) the assumption that BPR is a success factor for higher level of e-business implementation.

Based on the analysis of the results from the empirical study some general conclusion and future recommendations are given at the end of the paper.

I. INTRODUCTION

Striving to survive and become more competitive in today's e-environment, companies and their managers should redefine their strategies, organizational structures and business processes and to build technological infrastructure necessary for successful implementation of e-business solutions.

In order to achieve better market position and satisfy customers' needs better than competition does, companies and their managers should simultaneously conduct two projects: 1) business process change/redesign and 2) implementation of e-business solutions.

In today's global environment, companies are pressured to become more flexible, fast responding and customer oriented. To achieve these goals they should become process oriented. Business process orientation and

process thinking help management to leverage the use of the information and communication technologies and the Internet, and hence migrate to e-business with a greater success.

In that sense, business process orientation has become one of the most important management paradigms in the new millennium [1].

II. BUSINESS PROCESS ORIENTAION

The competitive global environment of the 21st century has reaised attention to business processes because companies primarily consist of business processes and not of products and services. Likewise, organization's performance nowadays is envisioned in the efficiency of its business processes that on the other hand requires a process orientation. Managing a business, means managing its processes [2]. Though, very important and key for the business survival and competitiveness, business processes has been neglected in the management literature for a long time, mainly because of the predominance of the functional organization of work.

Today, many companies worldwide have understood the meaning of their business process and are treating them as strategic assets. Very famous example is the dot-com company - Amazon.com which has patented its business processes: one-click ordering and internet-customer-based referral system – known as „affiliates“.

Companies competing in the new, digital economy should reassess the strategic importance of their business processes, and understand their organizations not only as constructions of functions and departments, but as highly integrated systems of business processes. In a word, they should become business process oriented. [2].

Although, business process orientation (further in the text BPO) is not yet recognized as an independent approach, it pulls significant attention from practitioners and researchers worldwide. BPO represents a generic concept of numerous management philosophies that use process perspective to improve business performance [3]. Many authors through time like Deming, Porter, Davenport, Short, Hammer, Byrne, Imai, Drucker, Rummler, Brache and Melan have viewed this concept as the new model of the organization. This new way of

thinking and viewing the organization in the literature has been generally described as business process orientation.

In the extensive literature on business process management, there are numerous definitions of BPO that vary, but one that is more generic and comprises all the elements of the concept is McCormack's and Johnson's [2] definition of process orientation: An organization that, in all its thinking, emphasizes process as opposed to hierarchies with a special emphasis on outcomes and customer satisfaction. The concept of BPO is based on the assumption that the value to customers is delivered by streamlining and accelerating work patterns [2], [4]. Placing the focus directly towards customer and managing end-to-end processes provides a strategic approach in achieving a competitive advantage in the current customer-centric business environment.

It is worth mentioning that the concept of business process orientation should not be equalized with a process-based organizational structure, since one company can reach a certain level of BPO maturity without formally being organized horizontally [5]. Due to that it can be concluded that process approach can be applied to any organization.

Moving towards process orientation for companies means numerous benefits like more efficient execution of work resulting in cost savings, improved customer focus, better integration across the organization and increased flexibility of the company accompanied with improved customer satisfaction. Another benefit from process focus is improved flow of hand-offs between functions that leads to cycle time reduction [6]. Process orientation reflected in processes that are broadly defined eliminates redundant activities, verifying inputs one time for all functions within organization [7].

Although empirical evidence is lacking, several models have emerged during the last few years proving that process-oriented organizations have better organizational performance rather than the ones that are not process oriented. They indicate positive impact of BPO on organizational performance [8], [9]. Further, it is indicated that investments in business processes creates competitive advantage for companies and provides significant improvement to the overall system [8], [9].

III. BUSINESS PROCESS CHANGE

Today, e-business initiatives have made the need to streamline, integrate and automate business processes even more pressing. As mentioned, business processes are crucial for organization's success. In order to maximize its competitiveness companies need to have business processes which are both well designed and work effectively.

In the literature, there are two basic ways of business process change. One is improvement and the other is innovation. But most of the companies when changing their business processes are placing themselves somewhere in the middle of these two concepts. This methodology is generally recognized as business process redesign [10]. Although these methodologies have different names in the literature, they are mainly

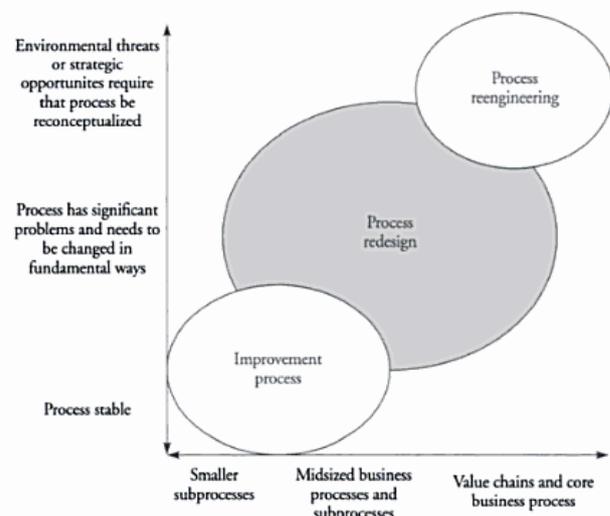
recognized as business process improvement and business process re-engineering.

Business process improvement (BPI) is a systematic approach that helps organizations makes significant changes in the way they do business. Business process reengineering (BPR) is the radical redesign of organizations processes i.e. radical change rather than a series of incremental changes. BPI is the process of developing and implementing incremental improvements for a process and it is used when business is manageable and processes are relatively consistent. There is low risk associated with BPI and it starts with the existing process. Opposite, BPR is a fundamental corporate reorganization based upon the processes that deliver value to customers. It typically involves re-orienting a business from a product or location viewpoint to a customer focus which means achieving some degree of business process orientation.

The major difference between these two methodologies is that BPI is based on problem solving, and BPR is based on radical change of the overall process. BPI is a tactical and BPR is strategic undertake for the company. Business Process Re-engineering is generally used at the strategic level, when major threats or opportunities in the business's external environment prompt a fundamental re-think of the large-scale core processes critical to the operation of the value chain. Business Process Redesign is an intermediate scale of change operation, appropriate for medium-sized processes that require extensive improvement or change. Redesign efforts often result in changed job descriptions and the introduction of some automation. Business Process Improvement represents a tactical level, incremental technique that is appropriate for developing smaller, stable, existing processes.

Depending on the complexity of business processes, Harmon [10] proposes the following matrix of business process change:

FIGURE 1 BUSINESS PROCESS RE-ENGINEERING, BUSINESS PORCESS REDESIGN AND BUSINES PROCESS IMPORVEMENT



Source: P. Harmon, Business process change: A manager's guide to improving, redesigning, and automating processes, Morgan Kaufmann Publishers, Boston, 2003, p.39

In order to achieve effective and efficient process change, it is very important that the level of process change fits the process itself. But, the level of required process change is also likely to reflect the process capability maturity of the business. If the business has mature process capabilities, process improvement efforts will be more or less continuous, undertaken by managers and their process teams. If a business has a low degree of process maturity then a process redesign effort might be required to establish the initial process capabilities.

Since business process re-engineering efforts of the 1990's didn't meet the expectations, business process redesign and integration of business processes have become a vehicle for achieving sustainable value for companies.

Implementing integrated e-business solutions in companies requires business process orientation and organizational transformation. Business process redesign is a pervasive but challenging tool for transforming organizations. BPR is a change management approach aimed at achieving quantum improvements in overall organizational performance [11].

IV. E-BUSINESS AND BUSINESS PROCESS CHANGE IN COMPANIES IN THE REPUBLIC OF MACEDONIA – SURVEY RESULTS

A. E-business in companies in the Republic of Macedonia

The process of creation and implementation of an integrated e-business solution nowadays is imperative for organizations. Information and communication technologies are implemented in great extent in each organization regardless its size, industry type and its market position. For organizations of leading market economies, the implementation of ICT and e-business in all aspects of the society and business is not new. Hence, in the time when technology is not a choice but an imperative for doing business, only the way of using it will be a considerable competitive advantage, and not the technology itself.

The correlation between the level of usage of ICT and competitiveness is familiar in the literature (Sharpe, 2006), as well as there are specific empirical evidence for the correlation between knowledge management tools, inter-organizational relationships and innovation with firm performance [12]. It is worth mentioning that the implementation of ICT is generally analyzed from innovation of business process management perspective. The competitive advantage of a company can be reflected in aligned business processed.

The level of implementation of ICT in organizations can vary. The fully –flagged e-business solutions are the best choice, since they provide synchronization of all business processes and activities and integration of all data form business operation of the companies. The integration of ERP systems with CRM modules in companies is becoming a common practice, but the trend of the extended enterprise where an overall integration with

suppliers as well is provided, is not yet a case for companies in the Republic of Macedonia.

According to the data of the State Statistical Office of the Republic of Macedonia, in January 2011, electronic transmission of data suitable for automatic processing, i.e. sending and/or receiving of data via any computer network (Internet or other), in an agreed or standard format which allows their automatic processing (e.g. EDI, EDIFACT, XML), to or from systems out of the enterprise, was performed by 37.4% of the enterprises. E-invoices suitable for automatic processing were more frequently received (by 9.3% of the enterprises) than sent (by 6.0%). Sharing information electronically and automatically between different functions of the enterprise was performed by 47.0% of the enterprises. Their own website/home page had 58.9% of the enterprises, and 10.4% had online ordering enabled via their website. During 2010, 6.9% of the enterprises with at least 10 employees had web-sales i.e. have received orders for goods or services via website, while 7.1% sent orders for buying goods/services via website. [13].

TABLE I. ICT USE IN COMPANIES IN THE REPUBLIC OF MACEDONIA IN 2011, (% OF TOTAL)

Enterprises (number of employees)	Open source ERP or CRM applications for business process automation	Electronic transmission of data suitable for automatic processing (EDI, XML, etc.)	Automatic share of information within the enterprise
10 - 49	12.8	31.9	40.4
50 - 249	13.3	39.8	49.6
250 +	19.5	51.0	65.1

Source: www.stat.gov.mk

It is evident that large companies (with more than 250 employees) have higher levels of implementation of ERP and CRM applications for business process automation, as well as higher level of electronic transmission of data (EDI, XML, etc.) and automatic share of information within the enterprise than the medium and small companies.

In the Republic of Macedonia, although the necessity of using ICT and integrated e-business solutions is recognized from many managers of companies of all sizes, Macedonian companies are still lagging behind the world. This situation is not surprising, having in mind the level of countries' overall economic development. The extensive use of ICT and integrated e-business solutions represent an imperative for the survival of Macedonian companies, not only on global market, but on the regional and domestic market as well.

B. Business process change/redesign in companies in the Republic of Macedonia

The goal of this paper is to consider the potential benefits of BPR projects when implementing integrated e-business solutions and their impact on competitiveness of companies in the Republic of Macedonia, as well as an initial estimation of process orientation of Macedonian companies. In this part of the paper, the results of the

empirical study will be presented. The main research question was to understand whether the business process change/redesign is a necessary project when implementing integrated e-business solutions in companies i.e. whether business process change is a critical factor of successful e-business implementation in companies in the Republic of Macedonia.

In order to understand the relationship between BPR and the level of e-business, an interview with managers in Macedonian companies was conducted based on the previously prepared questionnaire for business process orientation, business process change i.e. business process redesign, in order to confirm the assumption that BPR is a success factor for higher level of e-business implementation.

Since the research question was whether the higher level of e-business implementation is resulting from the BPR effort, the sample was chosen based on the previous selection to estimate the level of e-business implementation in companies in the Republic of Macedonia. The chosen sample was 30 companies with higher (highest) level of e-business adoption in the country, but the interview was conducted with 19 companies i.e. with their managers. The selection of companies for interview was made according the following criteria. First, the factor location of the companies doesn't play significant role since most of the companies with higher level of implementation of ICT and e-business solutions were located in the capital. Second, regarding the size of the companies (small, medium, large), small companies were excluded from the research since the level of e-business implementation is low in these companies in the country. Medium and large companies were selected for deeper analysis of the impact of BPR on e-business implementation. Third, regarding the industry type, several companies were selected from different industries previously indicated as leaders in e-business adoption in the country, like finance i.e. banking sector, telecommunications, ICT sector, manufacturing, and construction.

Regarding the profile of respondents, since the e-business implementation and BPR are concepts of strategic importance for companies and require support from the top management, respondents were mainly CEOs, IT managers, HR managers and marketing and sales managers in interviewed companies.

The questionnaire encompasses 4 parts. Part A was referring to business process orientation of companies. Part B was referring to the needs and reasons for business process change in companies. Part C was containing questions regarding BPR projects. Part D contains general questions about the company and the profile of respondent. At the end of the questionnaire, a part for comments of the respondents was also left, which helped us to better understand the problems that managers are facing when implementing e-business solutions and undertaking BPR projects.

Based on the analysis conducted on the results obtained by the interview, it can be concluded in general that managers of Macedonian companies understand the meaning and importance of business processes and they

view their organization as a network, system of business processes. Though, they understand the benefits and advantages of horizontal organization of work, still more than 3/4 of respondents confirm that the management and work in their organizations are still based on functions and not business processes. But, company can be process oriented without being formally horizontally organized. The interview shows that no company, yet, has process manager and process owner appointed although more than 20% of the respondents understand the necessity for appointing management staff based both on functions and processes.

The second part of the interview showed that 21% have made fundamental changes on their processes and business functions, 2/3 have automated their processes and functions, and 11% didn't conduct any changes in their business. Among the various reasons for conducting business process change specifically process automation; more than a half said that the change is needed for obtaining faster process and functioning. Only 2 respondents said that automation is needed for the reduction of the number of employees. The results also have shown that managers still don't think that the implementation of ICT and the Internet in the business is reason enough for business process change. Very surprising was the fact that 2 of the respondents are following the technological trends not because of the benefits that technology can provide for the organizational performance, but in order to "keep pace with the technology" which is not justified effort at all. Managers are investing in expensive software packages, but they are not using them in their full extent and for the right purpose. In order to avoid the negative effects of this not justified investment in technology, managers and employees should be trained for the benefits that technology can provide for improving overall organizational performance. Being aware of the right capacity and possibilities of e-business solutions companies can become more competitive, not only on domestic and regional, but on the world market as well. Managers in Macedonian companies still don't understand the strategic importance of ICT. Very often, they leave the decision for investing in ICT on lower level management, usually IT management.

The third part of the questionnaire referring to the BPR project showed that 4 companies are redesigning their business processes, 7 are planning to conduct BPR in the next 12 months, 5 in the next 2 years, and 3 don't plan to redesign their processes in order to implement e-business solutions.

Major motive for realization of BPR for managers is increased overall efficiency, increased customer satisfaction, competitiveness, as well as improving the information flow within the organizational units.

The implementation of ICT and e-business isn't recognized as important reason for conducting BPR. Regarding the financial returns of business process redesign effort, more than one half of respondents expect increased profit and 1/5 doesn't expect any financial result which indicates that managers don't understand the effects

of realization of such a project when implementing ICT in the business.

The realization of BPR project mainly is initiated by the top management. Having in mind the fact that the most of interviewed companies are with dominance of foreign capital and the dominance of foreign partners in the managerial boards, it can be concluded that the initiative for change derives from foreign partners.

For realization of BPR project, more than a half of the respondents will use consultants help, and they think that the management needs extensive training in the field, which indicates that there is a lack of expertise in Macedonian companies on this topic.

Based on the initial data obtained by interviewing managers of Macedonian companies, it can be concluded that:

- Managers of Macedonian companies understand the meaning and importance of the use of ICT and integrated e-business solutions in achieving competitiveness and increasing productivity;
- They understand the meaning and importance of business processes although their companies and work are still organized based on functions;
- They still don't recognize BPR as important factor when implementation ICT and e-business in companies;
- They require intensive training and knowledge dissemination in the business process management domain.

Business process change/redesign and e-business are strategic decisions and require top management support, financial investment, time and commitment of all human resources in the company. The trip towards process focused organization is not a revolutionary but rather an evolutionary effort. This means that companies should join all of its resources and forces in order to gain the promised benefits from these projects. This counts for Macedonian companies as well.

V. CONCLUSION

Planning, designing and creation of e-business solutions for companies are one of the main projects of the contemporary management in the new millennium. These solutions, representing very important projects for company's survival in the global market place, require solid methodological approach in order to be completed successfully. E-business solutions can be considered as valuable source of competitive advantage for companies, and as such they should be implemented in companies with highest attention.

Regarding the level of e-business implementation in companies in the Republic of Macedonia, it can be concluded that although the necessity of using ICT and integrated e-business solutions is recognized from many managers in the country, there is still a considerable gap with the world.

Though the integration of ERP systems with CRM modules in companies is becoming a common practice worldwide, as well as the trend of the "extended enterprise", that is not yet a case for companies in the Republic of Macedonia.

Regarding the business process orientation, managers in Macedonian companies are aware of the importance of business processes, but their companies i.e. the work is still organized namely based on functions. But, as confirmed in the literature, companies should not be completely horizontally organized in order to be process oriented.

In order to take the advantage of the process orientation when implementing integrated e-business solutions, companies, i.e. their managers have to understand that it is very important to start thinking and acting in a process way, since customers are five times less satisfied from the business process than the unsatisfactory product or service.

Regarding the estimation of the business process maturity level in companies in the Republic of Macedonia, a more solid empirical base should be formed in order to systematically analyze the level of BPO. Knowing where we are in comparison to others (regional and global competition), can help Macedonian companies to become more competitive and aware that the highest levels of process maturity can increase the overall performance of companies.

Macedonian business sector need guidance on the business process management trip by the educational institutions in the country.

Since the importance of this new management paradigm is recognized, the Faculty of Economics – Skopje, makes his pioneer steps in incorporating business process management topics in the faculties' curricula.

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Trends in Social Media Use on Macedonian Market – Comparative Analysis

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Abstract - In recent years, social media have become ubiquitous and important for social networking and content sharing among people and companies. There is a revolution happening from the school room to the board room. It is being driven by a fundamental shift in how we communicate and it is enabled by what we commonly call – social media.

Social media touch nearly every part of our personal and business live. Last year 93% of the marketers in Europe used at least one social medium to communicate with current and future customers. According to Financial Times, 97% of the companies in the USA have used social media for recruiting new employees. All these facts were inspiration for this paper to explore and see how companies are using social media in Macedonia.

For the purpose of this paper, a survey was conducted in Macedonian companies in June 2012. In order to explore see the differences and trends in social media usage in Macedonia, these data were compared with the data from the previous survey conducted in 2010.

I. INTRODUCTION

The main idea of this paper is to point out the importance of the rise of social media use from a company perspective in the region of South Eastern Europe and Macedonia. The world is changing in the way how the social media is used from different point of view. Each day we are witnessing new approaches and models used in order to be closer to the customers that add more value for them and achieve better segmentation of the market.

For the purpose of this paper, a survey was conducted in Macedonian companies in June 2012. Previous data from 2010 survey was taken in consideration in order to make a comparative analysis with the survey form 2012. Both surveys targeted same companies. The research questions were the same and the surveys refer to the way, usage and techniques of advertising on social media in Macedonia.

Changes in media consumption cause more genuinely engagement with the audience. New consumers must be communicated in a new innovative, authentic, credible and original way. They are no longer just passive recipients who just view, listen or read the ads, but rather they want to be actively engaged by using, trialing, experiencing and playing the content.

Besides the fact that nowadays consumers are overloaded with information, they are like never before empowered, in control and socially connected [1].

At the moment, the domination of the new social communication on top of older analogue technologies is rapidly growing. Why are social media so attractive?

Social media concepts provide a way of turning new media objects into social and cultural phenomena [2]. The possibilities such as: digital convergence, many too many communication, globalization, virtuality and interactivity, change the whole media philosophy.

Analyses of the new media age shows that the trend of the rapid growth of the social media will continue. As a fact, advertising worldwide in traditional media is constantly declining. In 2010 publishing newspapers drop by 18.7%, watching TV by 10.1%, and radio 11.7%, meanwhile digital advertising is growing, mobile 18.1% and online 9.2% [3]. Moreover many companies see their future in social media. Leading operators expects to generate their revenues from mobile advertising. For instance, Turkcell made \$100 million sales from mobile advertising in 2009[4]. In UK more than 50% of the mobile traffic is for Facebook in 2012, so we can only imagine what means the bad customer experience for some of the brands. Company Groupon reaches 1\$ billion in sales faster than any company in history by using social media as a market place, the Ford motor company launched on Facebook the new Ford Explorer and that generated more traffic than a final of Champion league add [5].

Mass media do not provide closer dialogue with consumers such as social media. Customers are looking for one to one communication. Worldwide only 14% trust traditional advertisements and more than 80% of the consumer trust peer to peer recommendation [6] what is typical for social media.

The social media enables each consumer to be communicated with a different target message.

For each company that is advertising on the media, it is important to have balanced media weight within the budget frames and to enable permanent presence during the whole campaign period among target groups.

Compared to the new possibilities that social media offer, the traditional media are still facing with the geographical limitation, communications that are strictly

one way, limited number of “players” in the market, high costs and many other disadvantages.

II. TRENDS IN SOCIAL MEDIA

Social media is a phrase that describes the platforms and other tools that connect people into social networks (of their choosing) online. Some of the household social media names worldwide (other than Facebook) are MySpace, LinkedIn, Twitter, YouTube, Foursquare Google+. [7]

The individuals that make up these online networks use social media to organize themselves according to (1) their interests and (2) their preference for the way they choose to share, store and deliver information within their community (or “network”) [8].

Individuals have made it clear they wish to connect with other individuals that they choose to, in the way that they choose to, and around topics and for reasons that they choose to.

The individual is at the centre of the social media revolution. And this is changing the way business is done.

Online social media also have a phenomenal growth rate, which leads to change in media consumption - major implications for how advertisers reach and target these consumers who are now spending less time within mainstream media sites or channels. Last year, 93% of the marketers in Europe used at least one social medium to communicate with current and future customers. Top social platforms used by companies in 2011 were 1.Facebook, 2.Twitter and 3.Linkedin [9]. Social platforms that will catch marketers’ interest and have increased investment in 2012 are Blogs, Forums and YouTube [10]. The trend in Macedonia is going in the same direction. From the pool of social media, companies mostly use social networks. Because of this fact, social networks were in the focus of the survey made in June 2012.

Brands also need to think about how social networkers discuss their brands and think about how to influence them. By expanding opportunities for instant feedback, online social media enable organizations to recruit customers to help shape their service for other customers through reviews and comments.

Since the social media are already known as the best choice for making a direction, they still remain easily recognizable by their common features: putting the users in the center of attention and enabling them to fulfill their needs through mutual collaboration, through forming functioning communities, based on personal trust and credibility.

Social media are user-generated content, where the customer is involved in the creation of the site, providing their own content.

Viral marketing is a technique tightly related to social media, as its main purpose is to reach large number of prospects through a word-of-mouth campaign launched through a few well-connected individuals.

III. SHORT SCOPE ON MACEDONIAN AND REGIONAL ONLINE ADVERTISING MARKET

The Internet usage rate in Macedonia is approximately 51.5% [11]. In the region, Slovenia has 71%, Serbia 56.2%, Croatia 59.2%, Bulgaria 48.8%, Albania 48.1[12]. Average penetration rate for EU Member States is 45% [13].

Majority of internet marketing in Macedonia consists of online advertising [14]. For instance, the only option under “marketing” menus on most Macedonian portals refers to purchasing advertising space for banner ads but in practice in Macedonia, a number of companies consider spam (unwanted direct marketing e-mail messages) as an acceptable form of marketing.

At the moment on the Macedonian market around 80 to 100 companies are active online. The size of the online advertising market for 2011 is 1.24 millions EUR, [15] which is 0.007% of the 17.7 billions EUR European online advertising market [16]. Macedonian online advertising in 2010 was 0.1% of the total media budget spent in Macedonia [17]. Compared to 2010 Macedonian online advertising market has grown by 72%. In the region, Serbian market in the past year has grown by 46%, Romanian 43%, Croatian 24% and Bulgarian 14% [18]. Just one agency in Macedonia deals exclusively with online advertising and is often used by marketing agencies as intermediary for simultaneous placing banner ads on multiple sites. In Macedonia this company runs maintenance of an advertising network across different media, including most of the influential portals, and also cooperates with global internet media such as Hotmail, Yahoo! and Facebook. It serves as exclusive intermediary for clients from Macedonia for banner ads on Facebook, while the contextual advertising is handled directly by Facebook.

Social media and online communities based on social networking software and collaborative filtering have emerged as significant element of information society and e-business, especially after a number of important startups such as MySpace, YouTube, and Facebook received worldwide fame through pricey acquisitions or high stock market evaluations, paired with user counts in the tens and hundreds of millions.

Facebook as quintessential representative of social media, due to the nature of the services it provides as social networking platform, its openness for integration with other applications providing social networking, collaborative filtering and distribution of user generated content, and due to its popularity. Both globally and locally in Macedonia, Facebook is currently the dominant social media, and the critical mass of its users makes it an effective tool for advertising and other elements of marketing, including research and testing.

From Table 1, it can be seen that Macedonia and Serbia have high Facebook penetration. This fact is important for companies, because half of the population in those countries have Facebook accounts. Using these social networks companies can easily reach mass people on the market and communicate their product or brand.

Albania has low Facebook penetration compared to country population, but like Macedonia and Serbia, high Facebook penetration compared to Internet penetration rate. This mean that from all people who has access to Internet 83.55% in Albania have Facebook accounts [19].

Many companies in Macedonia use the social media for the purposes of internet marketing, in particular for online advertising. In 2011 more than 200 companies were active with Fun pages on Facebook. Compared to 2010, there is an increase of 78% [20].

Ultimately, the new media age revolves around consumer communications where consumers increasingly want something more to engage them.

IV. COMPARATIVE ANALYSIS OF SOCIAL MEDIA USE ON MACEDONIAN MARKET

For the purposes of this paper, a survey on 80 active Macedonian advertisers was performed. From all companies in Macedonia only entities which have used social media advertisements and portals were targeted. The metrology used here was a survey that took place in June 2012. In order to explore, see differences and trends in media use, data from previous survey made in 2010 was used.

The survey includes Macedonian companies from all industries. Compared to 2010, in 2012 there is a slight increase on advertising market in telecommunication, automotive and trading industries. Company size in bought period does not differ much: micro companies (18%), small (36%), medium (23%) and big companies (23%). The main conclusions are that the advertising market in Macedonia is small in size and money. Only few companies are real players on the market. These are the companies which are coming from the banking and telecommunication sector. Those companies are usually FDI (Foreign Direct Investments). The companies usually used mix of internet marketing strategies for Internet and they do not relay only on one strategy.

TABLE I. FACEBOOK RANKING AND PENETRATION BY COUNTRIES (AUGUST 2012)

Type size	Criteria			
	Country	Facebook ranking of world FB ranking list	Facebook penetration compared to country population	Facebook penetration in relation to number of Internet uses
1	Macedonia	83	45.7%	89.6%
2	Serbia	45	47.6%	85.1%
3	Bugaria	57	33.7%	70.9%
4	Croatia	69	34.7%	69.4%
5	Albania	79	36.3%	83.5%
6	Slovenia	90	34.9%	53.8%

The most popular internet advertising technique in 2010 was the banner (47%). In 2012 the usage of banners declined (35%), but still it is the most used advertising technique. Figure 1 shows that social media as an advertising technique is increasing in 2012 compared to 2010. This is due to the fact that the general use of social media in Macedonia is constantly increasing in the past two years (26%) [21].

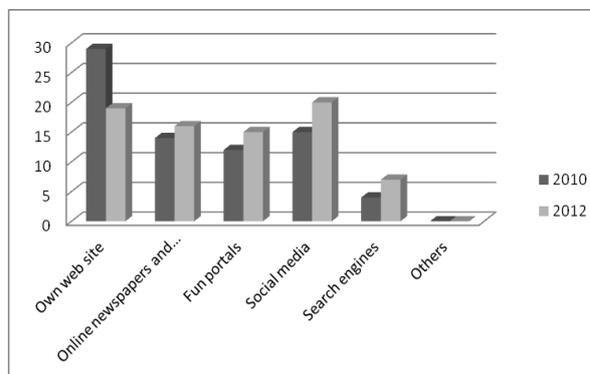


Figure 1: Survey results 2010-2012

What is interesting to mention is the low level of use of direct marketing as an advertising technique compared to other techniques. This trend continued in 2012. This indicates that popularity of this way of communication with customers is decreasing not only in the world, but in Macedonia as well.

Regarding the place for advertising in the survey of 2010, companies were advertising in 2 different places, usually their own web page and some other advertising method. In 2012, regarding this issue the situation has changed. Companies are using at least 3 different methods for advertising.

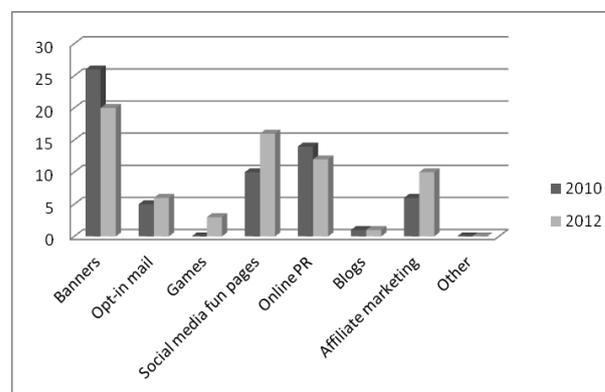


Figure 2: Survey results 2010-2012

Social media are the most commonly used method for advertising, followed by advertising on own web site and online newspapers. In the period 2010-2012 the share of the company’s social media advertising has increased from 10% to 20%. One of the goals of the survey, was to understand and compare how companies are pipelining their customers to their products and services, and from the graph above it is clearly seen that social media is

overtaking other advertising methods. Besides the increase of social media use, what is interesting to mention is the increase of search engines usage in 2012 (7% compared to 3% in 2010).

Most common types of social media for companies are Facebook, followed by Twitter and LinkedIn. Compared to 2010, in 2012 the usage of Facebook has increased by 7%. In the survey of 2012, all companies that were interviewed were using Facebook as a portal to attract visitors. In 2012 95% of the observed companies have fun-page on Facebook compared to 55% in 2010 (Figure 3).

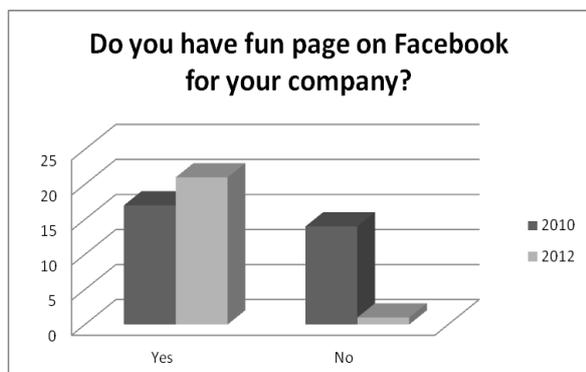


Figure 3: Survey results 2010-2012

Another important issue explored in the surveys is the criteria for choosing the advertising method. From Figure 4, it can be conclude that there are no significant differences in the criteria for choosing the advertising method. The first ranked criteria is the numbers of visitors/impression (40% in 2010 and 39% in 2012), the second ranked is the demographic structure of the users (28% in 2010, same in 2012), and the third is the content of the medium (27% in 2010 and 29% in 2012).

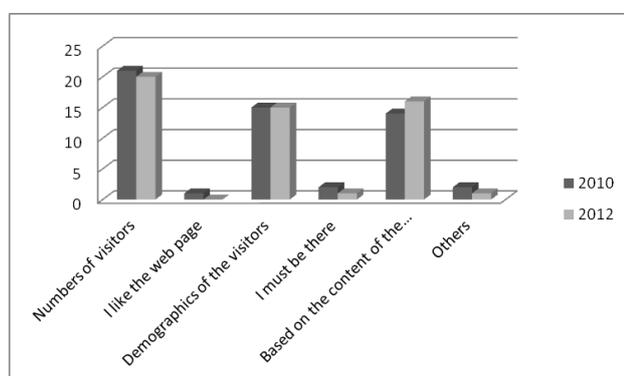


Figure 4: Survey results 2010-2012

From Figure 4 it can be seen that popularity of the company web page is still a powerful criterion for the companies in the process of decision making where to advertise.

There was a question in the survey about the Internet marketing expenditures and budgeting of the Macedonian

companies for their Internet marketing social media campaigns. This question was not answered by all companies. However this result was expected, having in mind the fact that Macedonians companies are generally reluctant to give information about financial data. Regarding this question from the analyzed answers, in 2010 the companies usually spent between 5% and 10% and in 2012 up to 20% of their marketing budget on montly bases. These numbers were expected due to the fact that Macedonian online market has grown by 72% in the past two years [22].

V. CONCLUSION

“We do not have a choice on whether we DO social media; the question is how well we do it” [23].

People are turning away from the old media, such as newspapers and television, and turning to new media to obtain news, learn new things and entertain each other with pictures, videos, music and games. The reason this shift has begun is simple: social media can gratify certain needs better than older form of media.

Social media encourages contribution and feedback from everyone who is interested. The voice of the youth has grown with the Internet. They are active communicators and eager adopters of new communication technologies.

Consequently, the social media turn into way of living instead of just being new intermediary.

Regarding Macedonians companies, social media have also a very high impact. Compared to 2010, today social media are the first choice methods to attract visitors, build brand awareness or generate sales. In 2012 compared to 2010 all the interviewed companies have fun page on Facebook, and on 2 more social media sites. Compared to the countries in the region, Macedonia is not lagging behind the usage of social media. The size of the online advertising market is small compared to neighboring countries, but is growing. Macedonian companies are spending more money on online and social media advertising. This trend is the same in the neighboring countries, and all markets for online advertising are constantly growing in the past two years.

Nevertheless, the traditional media are still dominant on the Macedonian market. Only 5% of the total media budget is used for online marketing.

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Methodology of Introducing K12 Curriculum for Improving Efficiency of Teaching Computer Science in Serbia

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Abstract - The proposed model of curriculum is based on the curriculum that is in the phase of implementation in the system of teaching computer science in USA. It is proposed by ACM K-12 Education Task Force Curriculum Committee. There is an idea of making the teaching of informatics curriculum for elementary and secondary schools that would provide an opportunity to integrate knowledge of content and compatibility of informatics in primary and secondary schools. There is a need to provide the connection between academic theory and technology in the modern world, and with it the necessity for educated population to utilize this technology in an efficient way and benefit humanity.

I. INTRODUCTION

We live in an "era of scientific-technical", "learning society and knowledge", "educational society", "the new informational civilization," "network society", with the application: intelligent learning environment, multimedia technology, information and communication technologies, digital technologies, new TV and video technologies and others. For example, this society can be characterized by several criteria: a means-work computer, basic production information, the dominant technology-information processing, basic resources-information, success criteria-speed information processing.

In fact today, there are many options and ways of gaining knowledge in information and communication technologies, but the best, the cheapest and the most extensive way is through the regular education system, through compulsory and optional subjects. Students in our country are not required to become computer literate during schooling, although without that knowledge today they can hardly be employed in the European Union. In primary schools, Informatics is an optional subject while in some schools they do not even have that option. In secondary schools, they have informatics all four years in some high school and only in certain technical schools.

The problem of organizing the teaching of computer science and from which class it should become a compulsory subject is an issue that has been debated for years in our country, but there is no progress. Moreover, when it will happen, no one knows, that is why I will rely my work on this problem.

With the development of information technology, more and more we are faced with the concept of information literacy, which is the basis for the development of modern society. In a society that is in our country. in households, 47% of the population own a computer, and 37% have Internet access. The encouraging fact is that among the elementary school students is growing interest in informatical knowledge. A teacher who refuses to become part of the information society is simply not up to the current generation of students. This paper will deal primarily with these problems I mentioned, only the problems that arise in elementary school and which are related to the teaching of computer science, but I Of course, looking around, where necessary, and at higher levels of education.

Due to the development of ICT implementation Serbia is lagging behind in the teaching. IT education in Serbia officially begins 1975th year through the teaching of the Joint middle-school education in a subject called OTP (technical training). In primary education, the idea was to achieve information literacy through elective course called Computers in the 7th and 8 grade.

In middle school education, some IT facilities were represented. Most of that was in the area of electrical engineering, administration and economy. In secondary schools in the third and fourth year, there was no class IT facilities.

The total concept of information education amounted to the introduction of computer architecture, system software, under which the computer works on and the use of word processor. Due to poor equipment and this is evident from the regulations that prescribe the types and number of computers in a school, what is coming out is that every school should have up to 8 home computers and a personal one. Such equipment instructed teachers to fact that students acquire computer literacy through lectures and students are reluctant to go on such lessons, what was an utter failure.

After 1990 and new reform of primary and secondary education, there is a more favorable position of Informatics. Thus, all secondary schools in the first year had the subject of IT and high school have the subject for all four years, especially in the natural orientations. Position of information literacy of students in primary education has not changed significantly since IT was still an elective in seventh and eighth grade.

Contents of IT education in the first grade of high school was related to exploring computer configuration, operating system, MS-DOS and Windows, as well as the appropriate Office, which monitors the operating system. Frequently the Office's word processor is doing. Materially equipped schools were such that most of them had one to three PCs. It may be noted that only students who had personal computers, or through non-formal education could not be trained in the use of computers.

By the reform of education in 2007, the position of teaching informatics in primary and secondary schools considerable has changed. In the primary schools from 5 to 8 grade, Computer classes are taught along with the technique by Subject Technical and IT education. The concept of the reformed primary schools places Informatics in an advantageous position. Computers are not only studied through compulsory technical and IT education, but also through elective "From toys to computers" (even from 1 to 4 years) and through the subject of Informatics and Computing from 5 to 8 grade. Measures are taken to improve the equipment of schools with computers with a minimum of 15 computers per school.

On order to be able to determine the essence of IT education of students in Serbia, we will compare it with the planned project in computer education for K-12.

This comparison will be done by comparing the plans and programs of IT education in elementary and high schools of Serbia and the appropriate level of IT education in the project K-12.

II. REASONS FOR ACQUIRING IT EDUCATION

Another important reason for acquiring computer education is the rapid spread of information technology and its growing intrusion in today's modern society. In contemporary social development of IT, education has taken center stage in today's information age. Today, more and more, the need for education based on methods that use information and communication technology is emphasized. In the last twenty years, modern technologies have changed many aspects of our lives, including how we learn, how we communicate, how spend our free time, and most importantly how we work. The path of development and application in general, started immediately after the Second World War. Our country is already at that time successfully followed a technological change. Since the purpose of our way of living and working environment changed as a result of a new technological revolution, it is necessary to change the concept of acquiring knowledge and skills of children to become successful people. Minds and interests of children and young people we have never been lacking, but it should still somehow channeled that energy and direct it to hit the target. Technology, especially in the form of personal computers and the Internet, has become the center of attention of educational policy [1].

IT knowledge occupies a prominent place in plans for the development of the education system in the world solutions, which begins with enrollment in primary (compulsory) school and lasts until the end of secondary education, while in our country, this is done through education optional electives. Therefore, we should strive to keep up with the plans and programs of other international communities in order to gain the greater computer literacy.

Also one of the important reasons why you should as early as possible enter the world of IT knowledge, is described in the following paper. Specifically archetypal characteristics of human beings are the fear of the new and unknown, and as such, it is understandable and very often present in adults who are the first time up to a computer. The problem is less present in the children, as they have much simpler approach to new things and are curious, and they are not burdened with many thoughts that plague adults. Would you be spoiling anything if I do this thing? Will I be funny if I ask something? So the solution would be found if the computer went into education and learning with technology already in the early grades of elementary school. All this led to the crucial question: "How to set the right classes in primary schools, and then in the middle, so that this and many other problems be avoided?"

Computer literacy is one of the mandatory conditions of employment because most employers address this type of literacy as a condition for employment. With the development of information and communication technologies, more and more entrepreneurs seek to invest in IT training for its workers. The formation of different courses, different age structure and education, seeks to improve its literacy of these advanced technologies. Also for work in different organs of the republic, the demand for this knowledge is of great importance, and those who work for private companies to those engaged in trade and services. Also, and this is one of the reasons that need to be addressed in order to be able to invest as much effort as the increasing presence of IT subjects in compulsory education. It is therefore important IT literacy of students.

In the early seventies in Western countries, experiments were conducted on computer science courses in high school, which later helped creation of the first program in the teaching of basic computer education. The greatest importance, cooperation and recommendations are made by supraregional institutions (representatives of some sciences) dealing with information technology in the school, they have recommended that a large number of students admitted into the structure and functioning of the computers and to be used the same, as a general tool for performing various tasks in educational institutions. There is a center for research and development practices in teaching and learning by whose merit was introduced, computers in education as a separate subject Informatics. This research center has developed the "Framework concept for the information technical education in the school and education", which was supplemented by the 1985th year that could be used in the school curriculum. After two years, he scored a total concept for information and technical education. In the nineties, there have been many recommendations of professional associations that attempts to create Informatics position in a school that suits her, and that its use of technology not would not be challenged in other school subjects.

III. THE STRUCTURE OF THE MODEL CURRICULUM FOR K-12 COMPUTER SCIENCE EDUCATION

We propose a model curriculum K-12 of computer science that consists of four levels and focusing on key strategic points:

1. Curriculum designed to prepare students for understanding of informatics and its place in the modern world.
2. Students should understand that computer science is based on strict principles
3. Students should be able to use the skills acquired in computer science (especially algorithmic thinking) when solving problems in other cases [2].

If computer science curriculum is applied, and if they are achieved set goals, students who graduate from high school should have enough knowledge to be good computer users and designers and also they can create software applications.

The structure of this model is shown in Fig. As the figure shows, the model has four levels whose objectives and activities are described below.

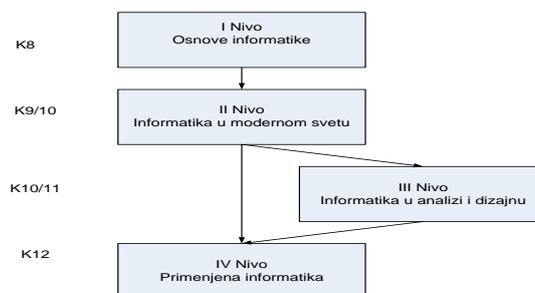


Figure 1. Structure of K-12 computer science curriculum

The first level (recommended for elementary school K8) includes IT as a compulsory subject in all grades. The subject of IT is supposed to provide primary school students basic computer concepts combining basic computer skills with simple ideas about algorithmic thinking. This can best be achieved by using the known science, math and social studies units. The combination of standards and an introduction to algorithmic thinking (which is offered, for example, by the Log (Papert)) or other practical experience should ensure that students reach this goal.

Students at the second level (which is recommended for grade 9 or 10) through a compulsory subject should develop a coherent and broad understanding of the principles, methodologies and applicability of computer science in the modern world. This can best be achieved in the form of a one-year course that will be mandatory for all students. Since, for most students, the second level will be their last encounter with information technology, it should be viewed as a basic preparation for the modern world.

Students who wish to study a broader and more detailed Information can choose the third level (recommended for grades 10 and 11), where IT is a one-year elective course. This course continues the study that started on the second level, but gives special attention to the scientific and engineering aspects of computer-mathematical principles, algorithmic problem solving and programming, software and hardware design, networks, and social influence. Students should choose this course if you want to expand your interests and preferences

towards information technology as a future profession [3].

The fourth level (recommended for grades 11 or 12) is an elective course that provides a detailed study of a specific field of IT. This, for example, can be a course of AP (Application programming) computer science that studies the programming and data structures. This course can also be in the form of the course, which is based on projects in multimedia design, or as a course in which he provided an accredited instructor and who can bring a professional certificate. Each course will be the fourth level, of course, require a different level as a prerequisite, while some will require a third level.

IV. CONCLUSION

Despite the different circumstances that are moving away from the world of our education, information technology, although more slowly, took a proper place in our everyday lives, our society and our education. With the expected improvement of standards of the population, expansion of computers is expected, because computers are now so applied that there is no area in which they do not have very important role. Of course all this can be accelerated if the citizens are enabled to gain the necessary skills to use information and communication technologies, as well as general knowledge needed for filtering, sorting, and meaningful use of information. This knowledge can be acquired continuously through

primary, secondary and higher education, different training, distance learning, etc.. This problem can be cut down at the root if the basic computer literacy acquired in primary school, and later in secondary education continued to areas related to IT facilities and thus spread the knowledge of this field. And how get that basic computer literacy? Of course, by the compulsory education in primary and secondary schools and in colleges, this and many other problems could be avoided. That is why the teaching of computer science is required to build basic computer literacy that is in the world for some time equated with basic literacy [4].

Model Curriculum for K-12 computer science education is necessary to develop by degrees and classes to obtain applicable curriculum that could be directly applied to our system of teaching [5].

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Linear Programming and Software Usage in Management Problems Solution

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Abstract - Linear programming is the most important and most frequently used method in business problems solution and it has and it will have great importance in management. Management, as scientific discipline wouldn't exist without linear programming evolution. The precise expression for this problematic is linear optimization, which will be (if we know linear equations) the base of the science which will meet many possibilities as well as many limitations as a part of management problematic. It will more and more push forward transport, economy, even the mankind, linking the people and the continents.

whole numbers programming, the variables of decisions are whole numbered.

In spite of the different problems which are treated by the linear programming, each problem of the linear programming has three elements: a group of decisions which have to be made, the target which has to be minimized or maximized depending of the nature of the problems to solve, and the group of the limitations which take some restrictions in the process of making the decision. The linear programming is, thus, quantitative method by which optimal group of decisions is found, i.e. decisions which ensure the extremes of the target function (maximal profit or minimal costs) in accordance with limited resources.

I. THE CONCEPT OF LINEAR PROGRAMMING

The linear programming is the most important and most used method in business problems solution. It has great importance in management. First, management as scientific discipline wouldn't exist if George Dantzig didn't initiated it through the development of linear programming in 1947. The method of linear programming is based on work of George Dantzig in a statistic part of US Air Force firm. The first problem which Dantzig solved (by simplex method) was the problem of nutrition with minimal costs, 77 possibilities and 9 restrictions. The National Bureau of Standards checked the solution and it needed 120 days with calculator usage. We can say that linear programming is intensively used in management, industry, health services, education, government and so on. Thus, linear programming is treated as the most frequently used quantitative method of optimization.

If George Dantzig had the opportunity to change the name of linear programming nowadays, it would be, most probably changed into *linear optimization*. In this case, we would avoid confusion by which the linear programming is closely connected with the computer programs usage. Although, the computers are used in LP problem solving, these problems are not the part of program commands. They are the mathematical models and their solution gives the decision makers optimal plan of treatment. Attribute "linear" derives from the usage of linear equalities and inequalities in mathematical model formulation.

The linear programming observes the problems in which linear **function of target** must be optimized (maximized or minimized) under the conditions or **limitations** given in the forms of equalities and/or inequalities and with non negative **variables of decisions**.

It is the formal procedure of the structure optimization in which the function of the target and limitations can be expressed by linear combination of variable units. In

A. The general model of the linear programming

Generalizing this LP model we can formulate general form of linear programming model with n possibilities for decision making and m limitations:

$$\text{Max } (c_1 x_1 + c_2 x_2 + \dots + c_n x_n) \quad (1)$$

With restrictions:

$$a_{11} x_1 + a_{12} x_2 + \dots + a_{1n} x_n < b_1 \quad (2)$$

$$a_{21} x_1 + a_{22} x_2 + \dots + a_{2n} x_n < b_2 \quad (3)$$

.....

$$a_{m1} x_1 + a_{m2} x_2 + \dots + a_{mn} x_n < b_m \quad (4)$$

$$x_1, x_2, \dots, x_n > 0 \quad (5)$$

c_i , **economic** coefficient

b_i , **limitations of the resource**

a_{ij} , **technological** coefficient

The linear programming solves the problem of function target **minimization**. In problems of minimization we usually find limitations such as "more or

equal". The problem of minimization could be turned into the problem of maximization.

Generally, there are three main principles of solving the task in linear programming: **graphical** – when the problem has two variables (in 2D level) or maximum three variables (in 3D space); **by hand** – when the problem has only a few variables (at the most five) and not many limitations, and, in that case, a simplex method is usually used; and **with the help of computer** – when the problem of linear programming has a lots of variables and structural limitations and when with the help of some programs we can make quickly and precisely a lots of calculations by simplex method.

B. Methods of optimization and linear programming

The methods of optimization enable to find the best solutions for different kinds of problems and they are very suitable for solving the problems in business economics. Typical business problems are connected with the usage of limited resources (people, equipment, material, financing, etc.) by which we try to make the biggest profit, ensure the best quality of service with existing business resources and so on. For all of these methods it is necessary to define the model of the problem, analyze the possible varieties of solutions and find the best possible solution respecting the selected criteria.

In business economics, the most used methods of *linear optimization* are those which try to find the best solutions for problems in which both, the target of function (e.g. profit) and the costs of the resources (e.g. material or time) are linearly proportional with the values of independent possibilities (e.g. the number of products). Because of that, we will describe in this chapter the methods of linear optimization. The representation will start with the description of linear programming which is the most important and most frequently used method in solving the business problems. At the same time, the linear programming is the base for some other linear optimization methods.

The linear programming is used a lot in business economics.

II. LINEAR PROGRAMMING WITH WHOLE NUMBERS

Some of the linear optimization problems are different from the problems of linear programming. The linear problems in which some or all the variables of decision are the whole numbers are being solved by *linear programming with whole numbers*; problems for which we have many targets are solved by *multi-criteria programming* and problems when we want to be closer to the target value by *target programming*. The problems of multiphase decision or the problems in which the parameters are changed through different periods of time are solved by *dynamical programming* and the problems in which there are some incidental variables are solved by *stochastic programming*.

The problems in which the function of the target or the limitations has nonlinear expression are being solved by *nonlinear programming*. All of these methods are the parts of *mathematical programming*.

The method of linear programming with whole numbers ensure the modeling and solving the problems of linear optimization in which at least some of the variables have the value with whole numbers. In case of *absolute linear programming with whole numbers*, all of the variables of the decision making must have the whole numbers. In case of *mixed linear programming with whole numbers*, some of the variables must have the value of whole numbers while the others can be continuous. In case of *0-1 programming* all variables must have value 0 or 1.

III. SOLVING THE PROBLEMS OF LINEAR PROGRAMMING WITH THE SOLVER

If we solve the problems of linear programming with only two variables, it is practically to solve the problem with the use of graphical or simplex method. But, in cases when we have the problems with more than two variables, graphical solution of the problem is not possible (exceptions are the problems with three variables, when it is possible to solve the problem in 3 D space). If we have problems with more than five variables, it is complicated to carry out the simplex procedure manually. Because of that, in cases of tasks with great number of variables in linear programming, it is recommended to use software package such as: QSB, Simple, What's Best (MS Excel), Lingo, Lingo etc. It is possible to download some of them from the Internet without restriction. The most favored of them is Lingo, because it can be used to solve the problems of linear programming even if they don't have the start base, i.e. problems which need two phased modification of simplex algorithm.

The real problems of the linear programming usually have a lot of variables and restrictions, so, for determination of their optimal solutions we need computer programs (software). Commercial software, designed to solve the real problems of linear programming, mainly work on the principles of simplex methods, whereas some of these software can represent each of the iterations individually.

In literature are usually found the examples of the Excel's solver for solving the problems of linear programming as well as for solving many other problems of operative research or scientific management.

A Simple Example

The Marriott Tub Company manufactures two lines of bathtubs, called Model A and model B. Every tub requires a certain amount of steel and zinc; the company has a total of 25,000 pounds of steel and 6,000 pounds of zinc. Each model of A bathtub requires a total of 125 pounds of steel and 20 pounds of zinc, and each yields a profit of \$90. Each model of B bathtub can be sold for a profit of \$70; it in turns requires 100 pounds of steel and 30 pounds of zinc. Find the best production mix of the bathtubs.

The Formulation

Maximize

$$P = 90x + 70y \quad (6)$$

Subject to

$$125x + 100y \leq 25000 \quad (7)$$

$$20x + 30y \leq 6000 \quad (8)$$

$$x, y \geq 0 \quad (9)$$

Where x and y are the numbers of model A and model B bathtubs that the company will make, respectively.

TABLE I. SOLVING BY INTERIOR POINT METHOD

	x1	x2	x3	x4	Obj
Initial	100	100	2500	1000	16000
1st	129.4	86.4	178.8	818.8	17698
2nd	152.8	58.7	3.3	1184	17861
3 rd	157	53.6	5.7	1250	17882
4 th	189	13.60	8.3	1810	17962
5 th	199.6	0.4	6.5	1995	17992
6 th	199.7	0.3	0.1	1994	17994
7 th	199.9	0.1	0.1	1999	17998
8 th	200	0	0	2000	18000

IV. CONCLUSION

Economy and management are faced with more complex and numerous problems. Many of these problems management, as a scientific discipline solves through the development of linear programming. The linear programming is the most frequently used quantitative method of optimization.

The linear programming solves the problems in which linear **function of target** must be optimized (maximized or minimized) under the conditions or **limitations** given in a form of equations or/and inequations and non negative **variables of decisions**.

Because the variables are numerous and there are more limitations in the process of optimization, it is clear that it is impossible to solve these problems without the use of the software. Nowadays, there is much software on the market which successfully deals with many variables of linear programming.

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ORSA – Organizing Software Application

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Abstract - Keeping track of numerous activists mobilized by common agenda or problem and coordination of their actions are common issues. An innovative approach by the new developed web based Organizing Software Application –ORSA is presented in this paper compressing all needs of a successful organization, and represent them for organizers. ORSA could be used as a convenient tool for summarizing reports and keeping track of a number of activists.

I. INTRODUCTION

All around the world people are organizing in order to actively affect their lives, by making joint moves toward governments or other forms of authorities. Usually, all these movements start at one point, but becoming quickly dispersed among the population, or large number of activists. Keeping track of numerous activists and coordination of their actions are common issues. Author's contribution in solving this problem lies in development of Organizing Software Application – ORSA, that will be described in this paper in details.

II. COMMUNICATION ISSUES OF ORGANIZERS

Community organizing is a process by which people are brought together to act in common self-interest. While organizing describes any activity involving people interacting with one another in a formal manner, much community organizing is in the pursuit of a common agenda [1]. Community organizing is often characterized by the mobilizing of volunteers or activists of some sort, and its organizing strategies include actions that are not so much demanding (time consuming or that need some sort of expertise). It is common cause that some group of people (NGO, political party...) needs to organize a much larger group of supporters to take an action that do not demand much effort, cognitive and physical. It is mainly confined to some sort of collection of signatures, or 1 to 1 meetings¹ with citizens. Such large actions always need some sort of backward reporting.

People are often motivated by urgency and outrage, and controlling their joint action could be very challenging, especially when it comes to measurable goals that are defined at the beginning. How do we control large dispersed group of outraged activists? Should we use

¹ 1 to 1 (one to one) meeting is common tool used with organizations from all over the world, to establish connection of common citizens with an idea of problem which an organization is solving. Citizens are directly involved in problem solving by speaking with activists one to one.

some kind of Project Management software? In this paper we discuss about newly developed ORSA suitable for quick and efficient monitoring large group of supporters, organized in snowflake like structure.

III. PROJECT MANAGEMENT SOFTWARE IN COMMUNITY ORGANIZING

Project management software represents many types of software, on-line, cloud-based or self-hosted, with support for common project management processes including estimation and planning, scheduling, cost control and budget management, resource allocation, collaboration software, communication, quality management and documentation or administration systems.

However, recent trends clearly show that all kinds of industries - including education, non-profits, construction, and manufacturing - are utilizing this software to tackle a number of complex project tracking and management issues. The right solution can provide individuals and teams in any setting with important tools that allow them to monitor the progress of a project, notice potential issues before they arise, meet deadlines, and collaborate more easily.

TABLE I. THE LIST OF 5 POPULAR PROJECT MANAGEMENT SOFTWARE SOLUTIONS

PM Software	Main Features
Microsoft Project ²	Microsoft Project features an intuitive interface that will be very familiar for any current and past Windows users.
Basecamp ³	Basecamp features a wealth of online tools for communication and collaboration, including a public message board, personal messaging, and automated email notifications.
QuickBase ⁴	Key QuickBase features include easy data importing from a variety of sources, such as Excel spreadsheets, customizable forms and project templates, automated email notifications, and advanced reporting.
FogBugz ⁵	FogBugz allows project members and team members to easily track bugs, scheduled items, and customer comments.
Huddle ⁶	Key Huddle features include customizable dashboards, an advanced search, project archiving, and online file sharing.

² <http://www.microsoft.com/project/en-us/project-management.aspx>

³ <http://basecamp.com/>

A list of five most recognizable Project Management software and their features is presented in Table 1 [2].

Project Management Software are a convenient way to control and monitor an organization, but its scope is limited to these professional organizations composed of people who are employed, since processes of implementing such software takes a relatively long time (installation, customization, and especially training for users). This kind of software is meant to last long (few years at least), so the initial investment of time and money in installation and training is usually justified. For community initiatives, where a large group of people is driven by a need to solve common problem, and who are not employed (they are usually volunteers), another type of Project Management Software is needed. There are a few online tools which can be helpful for organizers and activists (Table 2). Those tools are primarily oriented to the digital security of online activists, and security of activists on the field.

IV. DEVELOPMENT OF ORSA

The need of keeping track of the large number of activists, which are organized in hierarchical snowflake-like structure required an innovative approach. The authors were dealing with those problems, and developed Organizing Software Application – ORSA. It is a successor of the earlier developed software for the activities of one Serbian NGO, who mobilizes more than 200 volunteers for an on-field action. Volunteers were divided into teams, with the team leader in the head of everyone. Each volunteer had to fill-up dozens of forms and reports after field action, and many problems derived from that requirement emerged, as expected. How to collect all these reports? How to statistically analyze data in real time? How to get real insight in campaign process? A web based software, as a sort of interactive online database meant to be used by team leaders, volunteers and administrators was developed. Each team leader has an account, and he can customize team members. Other team leaders can customize their teams and see other teams too. Volunteers make reports, and all

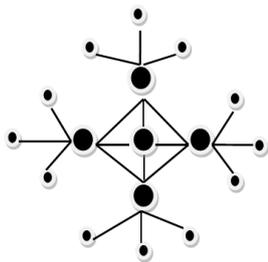


Fig. 1. An illustration of “snowflake” model of leadership⁷

reports are stored and measured in real time. All results and statistics are visible by any volunteer.

⁴ <http://quickbase.intuit.com/>

⁵ <http://www.fogcreek.com/fogbugz/>

⁶ <http://www.huddle.com/>

⁷ As seen on Fig. 1, this model can be represented from the mathematical point of view both as hierarchical, and as a snowflake, but, for a sake of primary idea that stands behind this type of organizing, and which is not driven by mathematical principles, we will

But, for further activities, such software was not

TABLE II. ONLINE SOFTWARE TOOLS FOR ACTIVISTS

Software	Main Features
CrowdVoice [3]	CrowdVoice is a user-powered service that tracks voices of protest from around the world by crowdsourcing information. [3]
Sukey [4]	Sukey helps people steer clear of injuries, trouble spots and violence. Sukey’s combination of Google Maps and also provides a way for armchair protesters to follow the action from afar. [4]
Crabgrass [5]	Crabgrass is free software made by the Riseup tech collective that provides secure tools for social organizing and group collaboration. [5]
Pidder [6]	Pidder is a private social network that allows people to remain anonymous, share only encrypted information and keep close track of their online identity. [6]

enough, as a relatively new model for practicing leadership is developing and known as the “snowflake model”. Leaders develop other leaders who, in turn, develop other leaders, all the way “down” (Fig. 1).

As prior software was limited to only one level of leaders, a new approach was necessary. As a result, new software was developed, with the possibility of creating an indefinitely large snowflake, and many more new features. It is called ORSA (Organizing Software Application).

V. MAIN FEATURES OF ORSA

As ORSA is derived from an idea of hierarchical snowflake organizing structure, developed and improved by Harvard University Professor Marshall Ganz, who is credited with devising the successful organizing model and training for Barack Obama’s winning 2008 presidential campaign, and many more successful grassroots campaigns. Consequently, main features of ORSA are developed having in mind those principles. ORSA is developed using known web-based technologies as PHP programming language, MySQL databases, JavaScript, HTML. It was developed in Zend PHP framework.

A. Infinitely large “snowflake”

As an idea behind community organizing actions is a dispersion of responsibilities all way down to the bottom level of activists (volunteers), the software should support a virtually unlimited number of levels inside the organization. Any volunteer can easily become a team leader, by simply adding more persons in his team bellow. Also, members of his team can make their own teams etc. Database is structured following a nested sets model, able to represent infinitely large hierarchy levels⁸.

call that a “snowflake” model, as developed by its creator Marshall Ganz, professor at Harvard Kennedy School of Government

⁸ A set-oriented method for representing trees in SQL that runs orders of magnitude faster than the adjacency list (i.e. child-parent pairs)

B. Creating of teams

As simply adding members to the team is not sufficient to create an effective team, additional info about teams created can be added, and reviewed by members. Every team defines its purpose, norm and roles.

C. Creating of goals

An administrator (top level team leader) can create a measurable goal for an organization. The term “measurable” implies that the goal set can be defined by quantity. While creating a goal (e.g. collecting signatures), the administrator defines quantity of goal that should be achieved (e.g. one thousand), and also a deadline for completion of goal. The administrator then disperses a goal over his immediate successors (children). Those children are the parent nodes now, and they can disperse given amount of goal that should be accomplished to their child nodes, etc. like shown on Fig. 2 (a), and Fig. 2 (b).

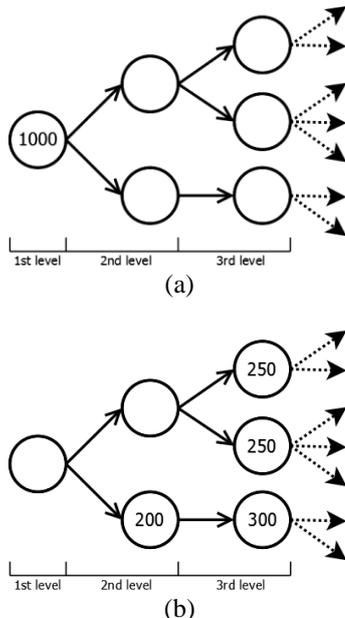


Fig. 2. (a) Administrator created a goal with amount of 1000; (b). Goal is dispersed among children

When children are given a certain amount of goal to accomplish, he can disperse that amount to his successors (equally or not), and to keep some amount for himself.

An administrator can create many goals within one action. Therefore the same people from the same structure can be engaged to accomplish many goals, simultaneously or one after another.

D. Reporting

One of the main issues of successful organized on-field action is reporting. An approach presented in this paper gives us a way of standardized reporting through an

organization in bottom-up principle. Each member of the snowflake structure (each node), can report on his progress by filling standardized form, where he can enter an amount of goal accomplished, along with additional comments. Information about goal accomplished is spreading through a snowflake to its center.

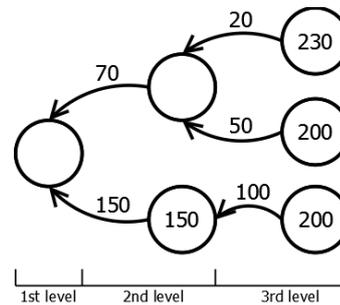


Fig. 3. Reporting through an organizational structure

E. Dashboard

Each member of an organization is logging as a user of the system. His first page is representing all necessary info about goals and actions he is engaged in. The Author’s solution to this demand is the creation of specific dashboard that will represent an overview of all activities user need to know. As every report is recorded and measured and sum of all reports is constantly comparing with measurable goal, any activist can have an insight into campaign process and goals accomplished. Also, a graphical representation in the form of line chart is very helpful for illustration of position and contribution of each one user. Every user can have an overview of the entire snowflake, but can only control nodes below.

Most organizations are using products which are suitable for relatively small and dedicated teams on a large scale. Using this system will help organizations that mobilize large groups of people to monitor and evaluate its common actions efficiently.

VI. TESTING THE SYSTEM

We tested the pilot system successfully with 1200 users. One NGO from Serbia needed to organize more than a thousand volunteers for their campaign among Roma people in Serbia. No more than five levels of nodes is created, which is enough for virtually any organization, though the system can support an unlimited number of levels. The system worked without any major difficulties, and all starting technical difficulties were overcome.

VII. FURTHER DEVELOPMENT

Author’s plan for further development includes developing a mobile application that will be used by activists to make reports at the spot. Also, reporting by SMS and automatic processing of SMS messages should be considered too, as many people do not have smartphones.

method is used to represent hierarchical structures in relational database. [7]

VIII. CONCLUSION

ORSA system, presented in this paper is a solution to a common issue of coordination of activists or volunteers. As it was tested with more than 1200 users, it is shown that can be used by numerous organizations or political parties. Instead of using unsuitable project management systems and tweaking those to match up their needs, or developing their own, all interested should consider using this system or developing something similar to it. The process of community organizing which follows already a successful pattern of snowflake structures demands well organized reporting system, and such advanced online software which uses creative approach is the answer to many organizations needs.

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Disaster Risk Management Web Enabled Information Technology

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Abstract - Identifying the risks of disasters occurrence and developing the strategies to reduce these risks has become one of the key tasks of the United Nations. Within the studies of Environmental engineering at the Faculty of Technical Sciences in Novi Sad, students have the opportunity to attend classes in the field of Disaster Risk Management. One of the goals of the subject study is an aspect of bringing the data required for the risk management process, into the spatial relations. Also, the complex task represents placing of data onto the Web with the aim of raising the level of availability of geospatial data and generating various types of necessary information for developing a Disaster Risk Management strategy. Utilization of information technology for the teaching process at the Disaster Risk Management subject and developing a network of geospatial data is also aligned with the strengthening of the local independence and with economic development goals.

I. INTRODUCTION

A. *The field of Disaster Risk Management*

United Nations defines disaster as a serious disruption in functionality of a community or a society. It can cause widespread human, material, economic and environmental losses, which exceed the ability of the affected community or society to cope using its own resources. Disaster results from a combination of hazards, conditions of vulnerability and insufficient capacity or measures to reduce the potential negative consequences of risk [1].

Any hazard, which is a triggering event, along with greater vulnerability, would lead to disaster causing greater loss to life and property. For example, an earthquake in an uninhabited desert cannot be considered a disaster, no matter how strong the intensities produced. An earthquake is disastrous only when it affects people, their properties and activities. Thus, disaster occurs only when hazards and vulnerability meet. It is also to be noted that greater capacity of the individual/community and environment to face these disasters reduces the impact of a hazard [2].

Vulnerability is an intrinsic characteristic of a community that is always there even in quiescent times between events. It is not switched on and off with the

coming and going of events; rather, it is a permanent and dynamic feature that is revealed during an event to an extent dependent on the magnitude of the harmful event. Determining vulnerability means asking what would happen if certain event(s) were to impact particular elements at risk (e.g. a community) [3].

The catastrophic events, that have occurred more frequently in highly developed countries in recent years, (for example tsunami in Japan with associated hazards in the Fukushima nuclear plant) reminding us that all countries, despite their level of development, are exposed to disasters. However, statistics have shown that the poor countries are most vulnerable to disasters [4].

On the territory of the Republic of Serbia, we only consider the disastrous forest fires, which have damaged many forested areas and arable land during the summer of 2012. The consequences of these fires are reflected not only on environmental devastation and the loss of ten thousand hectares of forest (1% of the forests in Serbia), but also on leaving many families, whose main activities are agriculture and livestock breeding, without any income. Only during August, fires in Serbia have caused damage of 20 000 000 euro.

Raising realization frequency of hazardous occurrences changed the approach to catastrophic events. At present, disasters are seen as a manifestation of unresolved development problems. Approaches to reducing the consequences of disasters have become more complex. Vulnerability, resilience and coping capacity as the terms have increased in importance as the attention focused on social, economic, political and cultural factors. Integrated disaster consequences reduction depends on the collaboration and exchange of knowledge between different disciplines and experts from various fields [4].

Disaster risk described above has to be implemented according to a certain rules. The field of Disaster Risk Management is a key component in management of these events [5].

B. *Disaster Risk Management cycle*

Disaster Risk Management (DRM) accumulates all activities, programs and measures, which can be taken up

before, during and after a disaster [2]. Disaster management involves a cycle, which should consist of an organized effort to mitigate against, prepare for, respond to, and recover from a disaster [6].

The disaster management cycle illustrates the ongoing process by which governments, businesses, and the civil society plan for and reduce the impact of disasters, react during and immediately following a disaster, and take steps to recover after a disaster has occurred. Appropriate actions at all points in the cycle lead to greater preparedness, better warnings, reduced vulnerability or the prevention of disasters during the next iteration of the cycle. The complete disaster management cycle includes the shaping of public policies and plans that either modify the causes of disasters or mitigate their effects on people, property, and infrastructure [7].

A key step in DRM is identification of the situation i.e. identification of the circumstances in which the area or community of interest exist. To achieve that, it is necessary to collect a number of a different data of the given area/community as well as to investigate the likelihood of disasters occurrences in a given area. Processing of collected data allows us to develop strategies for disaster risk management and measures for reducing vulnerability to a certain hazard. Therefore, it is necessary to look at hazardous events long before they actually occur, and figure out the measures to be taken before the disaster as the most important phase of the DRM.

For example, for an area that has been exposed to floods in the past, it is necessary to find out information about the level of preparedness of community for a possible realization of hazardous event. It is necessary to find out if evacuation plans exist, weather employed in the rescue services are trained for the emergency situation, does the community have enough capacity to take care of vulnerable population. Also, it is important to have information about the structure of population (for example percentage of men, women and children, percentage of old people, percentage of highly educated/illiterate people, which activities of inhabitants are prevalent). Certain measures can be taken in advance so that the population inhabiting a given area can be prepared for the possible future flooding. Examples of measures taken up before the flood are: building of embankments high enough for the case of the highest possible level of the river, relocation of settlements outside the area, which was flooded in the past, establishment and implementation of plans and regulations for flood defense, insurance in case of flood, information and education of the population and mapping risks. Measures listed above can contribute to reducing the vulnerability of the area/community to a flood.

In conclusion, with a greater capacity of the individual/community and environment to face the disasters, the impact of a hazard would be reduced [2]. So, it is important to include all DRM phases in process of planning measures for reducing vulnerability.

II. CONTEXT AND FOMAT OF DATA

In the process of collecting the data necessary for the development of Disaster Risk Management strategies, it is

necessary to be guided by the reducing vulnerability of the area to a particular hazard. Data are collected in accordance with the needs of each individual phase of DRM as well as with financial constraints. There are various methods of data acquisition, but if, for example, a field researches are beyond the state's financial limits, it is necessary to find an alternative and affordable methods of data collection. Some of the methods that can be used for data acquisition are: satellite observations, remote sensing, field research, conducting a survey of the population, a statistical prediction based on available information, research of the Web, etc.

Also, some information can be easily found, but they are often presented in a format that is useless in the field of DRM. For example Real Estate Cadastre contains detailed information about the land, buildings, their structure, but both analog and digital format of the data can not be used for making decisions in DRM. Such data can be transformed and organized in multi-functional databases that further could be used in accordance with the needs of the process that we are dealing with. Therefore, it is necessary to think about the most appropriate forms of data in the context of the information that we want to provide.

In this context, it is to be noticed one more characteristic of data - flexibility i.e. it is important to keep in mind that some information can be changed within a very short period of time. For example, the number of population in large cities can be changed on a weekly basis. Using the city's main traffic arteries are changing on a daily basis.

Because of all the reasons mentioned above it can be concluded that it is very important to place the data in an appropriate way and in the suitable format so that the information necessary for the process of DRM are promptly available and usable.

It can be concluded that there is a need for bringing the data into the spatial relations and for the integration and interoperability of such data.

Bringing data into a spatial relationship can provide information from a set of raw data. Geo-information is defined as digital or paper format description of geographic location, characteristics and information related to real word features, which facilitate decision making regarding disaster management [8]. The collected data are placed into the attribute table of the spatial database, thus, it is achieved multifunctionality of data in a format suitable for users with different needs.

To make heterogeneous data usable and understandable it is necessary to integrate it in accordance with prescribed standards. Open Geospatial Consortium (OGC) is an organization that has contributed to the development of standards required in all areas related to bringing the data into the spatial relations. Those standards enable connection between professionals from different disciplines dealing with location associated data. This ensures that interested parties in the field of industry, manufacturing and academia, both producers and consumers can achieve data communication and exchange of geospatial information at all levels. Here are just a few

basic data formats, which OGC provides: KML, GML and CITYGML.

By bringing the data into an appropriate form and placing it on the Web, interoperability is achieved. Interoperability enables heterogeneous systems to work together so that the information could be exchanged and made available to the user, while at the same time not requiring additional surgery for two systems communication.

Consequently, computer applications and IT infrastructure are essential for disaster risk management as they reduce the time necessary to gather, process, and present information to support human decision making process [5].

III. TECHNOLOGICAL FRAMEWORK FOR CREATING DATABASE AND PUBLICATION OF PRODUCT ON THE WEB

In the process of teaching the subject, "Disaster Risk Management", students have the opportunity to use current GIS tools in the context of this subject area. Methods for assessment of risk, vulnerability and exposure of certain areas to a given hazard include bringing data into spatial and mutual relations, as well as performing calculations and estimations, reasoning and decision making on the basis of the display.

For teaching purposes, students were tasked to display all existing health centers and hospitals on the territory of Novi Sad, as well as to assign attribute data to the obtained layer. The obtained interactive layer is imported into previously formed database and then placed on the Web. Thereby availability and interoperability of information is achieved i.e. a contribution in mapping of risks and creating the disaster risk management strategy in Novi Sad is made.

In order to create interactive layer of medical centers in Novi Sad and to publish that product, the following tools were used: QuantumGIS, relational databases PostgreSQL with PostGIS template and pgAdmin platform for the administration, and server application GeoServer supported with WMS (Web Map Service), WFS (Web Features Service) and WCS (Web Coverage Service) standards.

A. QuantumGIS

Basic input data in QuantumGIS is a map of Novi Sad with precise coordinates of health centers and hospitals in the city, which were collected through the Web survey and field research. Vector layer of health centers were then assigned to the Novi Sad map. Further, attribute data about health centers in a tabular form were assigned to the obtained layer. Attribute data in the table include: accurate address, phone number, capacity of the center/hospital (number of beds plus one third of that number), type of ambulances and dispensaries. Project is saved in a form of a shapefile, and then exported to PostgreSQL database.

B. PostgreSQL and PostGIS

The formation of a new database is performed in pgAdmin application of PostgreSQL relational database, which defines the template that will be used. In the Fig. 1

it is shown that PostGIS template was used in this case. PostGIS adds support for geographic objects to the PostgreSQL object-relational database. In effect, PostGIS "spatially enables" the PostgreSQL server, allowing it to be used as a backend spatial database for geographic information systems [9].

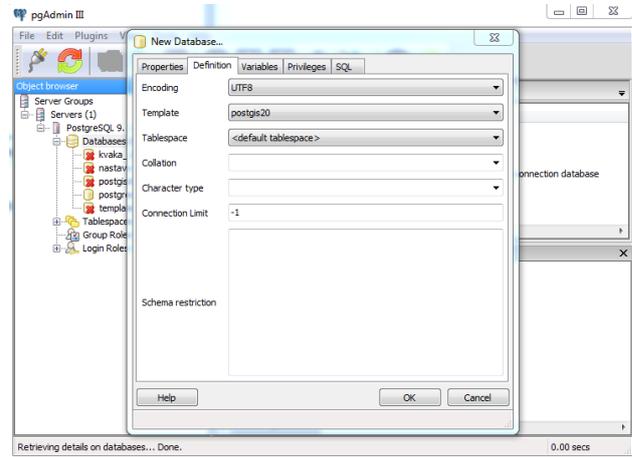


Figure 1. Creating a new database in pgAdmin

C. Importing of a shapefile in the formed database

Importing of the formed interactive layer of medical institutions is done in the software application QuantumGIS. First a shapefile is opened, and then relationship between QGIS and the newly created database is formed (Fig. 2).

After all described above is done, data are in the form suitable for a publication.

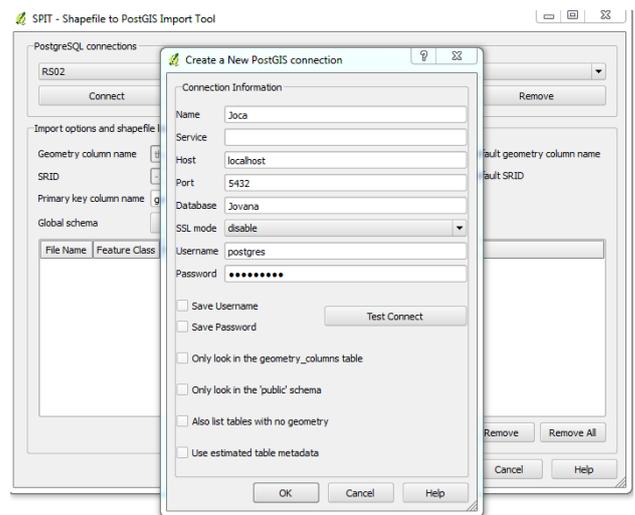


Figure 2. Creating a new PostGIS connection

D. GeoServer

GeoServer creates Web services that allow us to publish geospatial information. In GeoServer we must enter the parameters of previously designed relationship (between QGIS and database) and then the contents of the PostgreSQL database can be read. WMS, WFS and WCS services enable identification of the format in which

spatial data are stored in the database and define how they will be placed.

E. Publication of product

Web platform OpenGeo Suit which encompasses GeoServer and PostGIS, also contains OpenLayers JavaScript library for placing produced layers on the Web and GeoExt library for creating rich Web mapping applications. GeoExt supports GeoExplorer application, a tool for browsing geospatial data on the Web. With

support of all tools mentioned above we can join appropriate map background to the produced vector layer of health institutions. Thereby, we obtained the desired product in a format suitable for publication. The input data in the GeoExplorer is vector layer in WMS format i.e. XML text file from GeoServer, while the output is a script from which html file is formed (Figure 3). In this case, html file is published on www.drrrc.rs, so produced interactive medical institution layer with associated city map become available to the public.

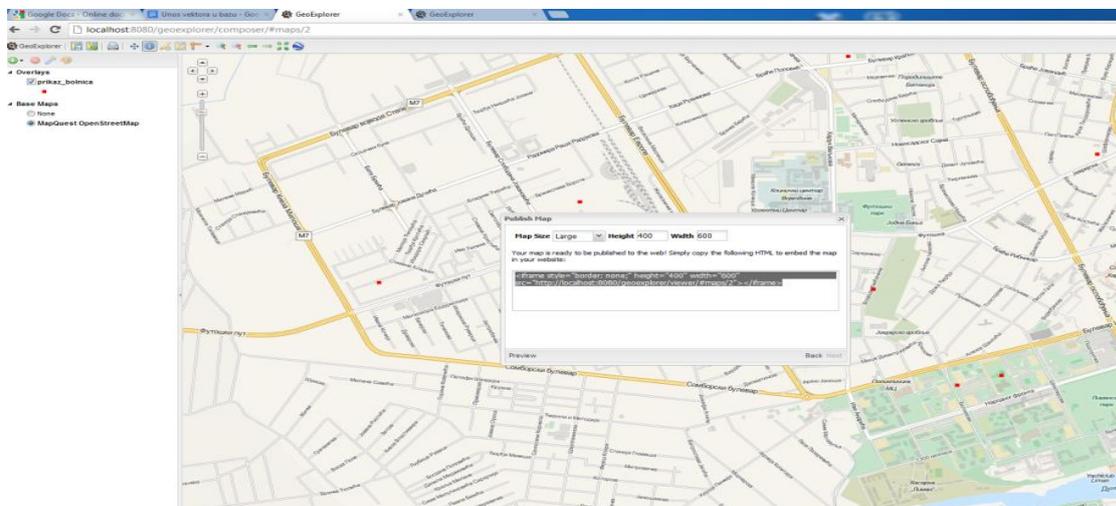


Figure 3. Vector layer for a publication and a script for creating html file

IV. CONCLUSION

Publishing on the Web interactive display of health centers and hospitals in Novi Sad with the associated database is only one step in the development of disaster risk management strategies. In terms of risk, for example, of technological hazard such as damage in the oil refinery in Novi Sad or a fire in an industrial plant or at urban location our product could contribute to a faster and more effective response to the certain catastrophic event. By brief examination of the interactive layer of medical centers, information about the nearest health institutions, where injured population can get first aid, can be provided. Also, information about capacity or organization of each individual institution is highly important during the disaster occurrence because of the limited time available for making decisions.

In the process of developing a disaster risk management strategy, it can be taken into consideration that similar products (layers) can be combined with existing one. For example, if the vector layer of all roads in Novi Sad with the associated traffic frequency data is overlaid with a layer of health centers, information about the nearest and least frequented paths to certain health facilities will be obtained. That also reduces the time required for providing first aid.

Therefore, development of the Disaster Risk Management strategies should be followed by the development and use of the Internet and information

technologies. DRM Web supported information technology enables successful placement of information and data communication at all levels. Developing of a data communication network contributes to providing “the right information, in the right format, to the right person, in time to make the right decision” [6]. Also, a contribution is made in terms of availability of reliable, accurate and opportune data.

Disasters affect all classes of population and delimit sustainable development. Therefore, actions within the scope of DRM are necessary at all levels.

The development of the described databases, with respect to data standards enables networking of various interest groups, such as non-government organizations, general public, experts in the field of DRM and members of the government sector, which make decisions about investment in the development of DRM strategies.

Use of open-source tools initiates a contribution to the reduction of costs associated with DRM strategy, which is in line with regional economic and sustainable development. Also, standardization allows interoperability with other participants in the topic.

It is also to be noted, that training the students to input data into spatial relations and place obtained geospatial information on the Web represents a step towards raising awareness of the importance of data interoperability. Thus generation of young, conscious professionals who are ready to manage disaster risks is created.

ACKNOWLEDGMENT

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Using Bayesian Classification in e-learning

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Abstract - This paper proposes using Bayesian methods in e-learning system for classifying the learning contents published by teachers and propose the most adequate learning materials for students. The most materials in the case of e-learning are stored in a textual unstructured form. A means to provide high-quality information from unstructured text is text mining. Our proposal uses Bayesian classifications to classify learning materials into different appropriate categories. In order to make the process of information retrieval efficient, each category contains a manageable list of keywords.

I. INTRODUCTION

One of the major problems faced by data-mining technologies is how to deal with uncertainty. The most important characteristic of Bayesian methods is their explicit use of probability for quantifying uncertainty. Bayesian methods provide a practical method to make inferences from data using probability models for values we observe and about which we want to draw some hypotheses. Furthermore it provides the means of calculating the probability of a hypothesis based on its prior probability, the probability of the observations, and the likelihood that the observational data fits the hypothesis. [1]

A Bayesian network is a model of a joint probability distribution over a set of random variables. It consists of a network structure and an associated probability distribution and can be seen as an alternative to logistic regression, where statistical dependence and independence are explicitly represented, and not hidden in approximating weights as in logistic [4]. It has two constituents: One is a network graphical structure which is a directed acyclic graph with the nodes of variables and arcs of relations. The other is the conditional probability table associated with each node in the model graph [6].

When used in conjunction with statistical techniques, the graphical model has several advantages for data modeling. One, because the model encodes dependencies among all variables, it readily handles situations where some data entries are missing. Two, a Bayesian network can be used to learn causal relationships, and hence can be used to gain understanding about a problem domain and to predict the consequences of intervention. Three, because the model has both a causal and probabilistic semantics, it is an ideal representation for combining prior knowledge (which often comes in causal form) and data. Four, Bayesian statistical methods in conjunction with Bayesian

networks offer an efficient and principled approach for avoiding the overwriting of data. [5].

II. BAYESIAN CLASSIFICATION

Classification is one of the significant functions of data mining which accurately predicts the target class for each case in the data. A classifier is a statistical procedure which is able to group items based on certain quantitative characteristics. General, a classifier is a mapping ($X \rightarrow Y$) from a feature space X to a discrete set of labels Y . For example, if system need to detect the category of some tutorial in e-learning system, a classifier should be provide information for the tutorial (keywords) and would output Y as name of category where the tutorials belongs.

Bayesian classifier is a term in Bayesian statistics dealing with a simple probabilistic classifier based on applying Bayesian theorem with naive independence assumptions. In simple terms, Bayesian classifier assumes that the presence (or not presence) of a particular feature of a class is unrelated to the presence (or not presence) of any other feature.

For example, if some learning content contains several row of code and several keywords such as programming, debugging, source code and etc., it can be consider as tutorial for some programming language. Or, if learning material contains information about hardware components, that tutorial can be consider as tutorial for hardware.

Usually, classification is a preliminary data analysis step for examining a set of cases to see if they can be grouped based on "similarity" to each other. The ultimate reason for doing classification is to increase understanding of the domain or to improve predictions compared to unclassified data [7]. In case of e-learning systems, classification will produce more practical and effective access to learning material. Also, system will be easy for using and accessible for all users. Figure 1 shows very simple Bayesian Classifier that can classify tutorials into one of several categories, based on five random variables.

The programming variable can take the values source code or variables, networking can be cable or wireless, design can be computer graphic or web design, hardware can be PC or laptop and application can be mobile or desktop.

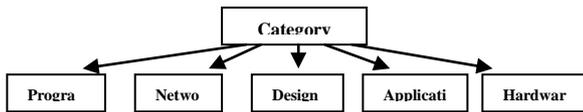


Figure 1. Simple Bayesian Classifier

On [10], authors made comparing between four classification algorithms: Decision Tree, Bayesian, Support Vector Machine and K Nearest Neighbor, and got following results:

Statistical technique of the Classification	Prediction / Precision
Decision Tree	80.113%
Bayesian	80.113%
Support Vector Machine	78.409%
K Nearest Neighbor	72.443%

Because of advantages of Bayesian classifier, and the result from comparing from [10], we choose Bayesian algorithm as classification algorithm in our model.

III. IMPLEMENTATION OF BAYESIAN CLASSIFICATION WITH PHP ONCLUSION

In this paper, we are concentrating of classification of learning material in e-learning system by using Bayesian classification to detect the most appropriate category for each tutorial in e-learning system.

The implementation starts by calculating the prior probability (the chance of it being one or the other before any tokens are looked at) based on the number of positive and negative examples - in this example that'll always be 0.5 as we have the same amount of data for each. We then tokenise the incoming document - tutorial (calling the function `make_tokenize()`). The final result is sorted, and returns the highest scoring class. The other used method in Bayesian classification implementation is `add_To_Index`. Listing 1 shows the Bayesian classification implementation:

```

class Opinion {
    private $index = array();
    private $classes = array('pos', 'neg');
    private $classTokCounts = array('pos' => 0, 'neg' => 0);
    private $tokCount = 0;
    private $classDocCounts = array('pos' => 0, 'neg' => 0);
    private $docCount = 0;
    private $prior = array('pos' => 0.5, 'neg' => 0.5);

    public function add_To_Index($file, $class, $limit = 0) {
        $fh = fopen($file, 'r');
        $i = 0;
        if(!in_array($class, $this->classes)) {
  
```

```

        echo "Invalid class specified\n";
        return;
    }
    while($line = fgets($fh)) {
        if($limit > 0 && $i > $limit) {
            break;
        }
        $i++;

        $this->docCount++;
        $this->classDocCounts[$class]++;
        $tokens = $this->make_tokenise($line);
        foreach($tokens as $token) {
            if(!isset($this->index[$token][$class])) {
                $this->index[$token][$class] = 0;
            }
            $this->index[$token][$class]++;
            $this->classTokCounts[$class]++;
            $this->tokCount++;
        }
    }
    fclose($fh);

    public function classiff($document) {
        $this->prior['pos'] = $this->classDocCounts['pos'] / $this->docCount;
        $this->prior['neg'] = $this->classDocCounts['neg'] / $this->docCount;
        $tokens = $this->make_tokenise($document);
        $classScores = array();

        foreach($this->classes as $class) {
            $classScores[$class] = 1;
            foreach($tokens as $token) {
                $count = isset($this->index[$token][$class]) ?
                    $this->index[$token][$class] : 0;

                $classScores[$class] *= ($count + 1) /
                    ($this->classTokCounts[$class] + $this->tokCount);
            }
            $classScores[$class] = $this->prior[$class] *
                $classScores[$class];
        }

        arsort($classScores);
        return key($classScores);
    }

    private function make_tokenise($document) {
        $document = strtolower($document);
        preg_match_all('/\w+/', $document, $matches);
        return $matches[0];
    }
}
  
```

IV. CONCLUSION

There are a lot of technologies that enable different ways to store and share large amount of data. Some of them are useful for some users, but it's almost impossible to be found the most appropriate date from tremendous amount of data. But, using data mining technique will produce efficient and easy access to useful information. On the other site, implementing e-learning within the educational process becomes more than

necessary. If we make combination from e-learning and data mining, undoubtedly will get learning system that will be adaptable to users (teachers and students) needs. By using the Bayesian classification, system can easy and effective categorize the learning content to the most appropriate categories.

Some of the advantages of Bayesian classifier are very easy implementation with very low computational cost, requires a small amount data to estimate the parameters which are necessity classification. It is fast and incremental can deal with discrete and continuous attributes, has excellent performance in real-life problems and can explain its.

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Framework for Developing Web Applications with NoSQL Databases

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Abstract—In business environment which is highly competitive the need for distributed web applications became more and more popular. Possibilities of scaling data in traditional RDBMS are very limited or not supported at all. In this paper the investigation of new class of database system referred to as “non-relational databases” is conducted. Also the paper gives important guideline for developing web-oriented e-commerce applications using NoSQL database structures.

I. INTRODUCTION

The development of ICT (information – communication technology) directly influenced the changes in software development methodologies for the past thirty years and more. It is noteworthy in the recent history the emergence of client – server applications where the data was processed on the server side and then presented on the client’s side. This was fundamental for the three layer architecture which became one of the most important methodologies in development of web oriented applications.

However, as the development of software methodologies were always closely related to hardware changes, we are witnessing a vogue name ubiquitous computing, which involves integration of computer technology into all aspects of human life and daily activities[1]. One definition of ubiquitous computing talks about the world in which machines fit the human environment instead of people fit into the world of machines. Such trend has created a new problem of potentially large number of users simultaneously accessing and modifying data in databases which are used by web applications.

The number of users who are accessing web oriented business applications is increasing rapidly. Table I illustrates this fact:

TABLE I.
NUMBER OF USERS OF ONLINE APPLICATION [2]

Online applications in 1975	Web oriented applications in 2012
2000 users	Around 2.2 billion users
Static users population	Dynamic users population

Growing user demands toward databases have affected the structure and schema of database. The database has to fit the data and not vice-versa which was the case in past.

Many things have changed in past forty years. Hardware design is completely different, processors are many times faster, memory is thousands time larger. The main aspect of database design in past was the business data processing. Today there are lot of different markets

and different requirements for database design. Despite those changes, the relational model remained dominant until the beginning of the new millennium. The new concepts in distributed computing and the cloud computing paradigm though, are demanding the new database architecture to be written without security and consistency loss.

This paper deals with the question, if the forty year old model is good enough to meet these demands, or the database vendors should embrace one of the new concepts in database design.

II. A BRIEF HISTORY OF DATABASE STRUCTURES

The database paradigm was one of the growing fields of research in 70’s. The first system which implemented a Structured Query Language (SQL) was IBM’s System R which became the foundation for many of today’s Database Management Systems (DBMS). In the beginning of its development this system was constructed to demonstrate that the usability advantages of the relational data model can be realized in a system with complete function of high performance required for every day production use [3]. The goal was to isolate the end user as much as possible from underlying storage structures. The relational model of data, which was presented by Edgar F. Codd, provided a basis for a higher level data language which will yield maximal independence between programs on the one hand and a machine representation and organization of data on the other [4].

There were three basic components defining this data model:

- Data structure – which represents the data types model is build of
- Operators – which represents the available operations to retrieve or manipulate data from this structure, and
- Integrity rules – which are the rules for keeping the data in consistency.

The structure of relational data model consists of relations typically visualized as tables, with attributes as columns and records as rows. Integrity rules to maintain a relational model are constraints (uniqueness of primary keys to ensure the integrity within the single table), and referential integrity rules between different tables.

Company		
Id	Name	Address
C1	Sever	Mag.polja
C2	Loher	Subotica

Product	
Id	Name
P1	Wind Generator
P2	Asynchronous Motor

Manufactured	
C_ID	P_ID
C1	P1
C1	P2
C2	P2

Figure 1. Example of relational database used to store information about companies, products, and manufacturing of products by companies. Since the relation between companies and products are many-to-many relations, join table has to be used.

One of the fundamental properties of the transactions which are the most important concept of the relational model is known as ACID— *atomicity, consistency, isolation* and *durability*. If embedded this properties ensure that database transactions are processed reliably [5]. The most trivial example is the money transfer from one account to another. After successful transaction, the cumulative sum of both accounts has to be the same. Even though all four ACID properties are seen as key properties of transactions on relational databases, consistency is particularly interesting when investigating the scalability of a system which became inevitable in today vogue of application development. Users of the applications expect to have data access anywhere and anytime. Application developers have to use the new concepts of hardware infrastructures and platforms. Cloud computing paradigm emerged naturally at this point as the solution for these problems.

A. Cloud computing paradigm

Applications and services in the cloud are run on virtualized resources in distributed network environment. The most important feature of this environment is scalability. Services in this environment are divided to:

- Infrastructure as a service (IaaS) – is a layer which offers storage and computing resources which developers use to deliver custom business solution.
- Platform as a service (PaaS) – offers development environment that can be used to create cloud-ready applications and solutions.
- Software as a service (SaaS) – offers purpose built solutions for end users.

The greatest thing for users and customers of IaaS and PaaS is a *pay as you go* concept which is similar to electricity use and payment. Customer pays only for what have been used in the previous period of time.

B. Scalability and data consistency

Scalability of a system is its capability to cope with a growing workload. There are two directions of scaling the system: *vertically* or *horizontally*. Scaling vertically (scaling up) usually means adding resources to a single node in the system (addition of CPU’s or memory upgrade). Horizontal scaling (scaling out) refers to adding more nodes to the system, such as adding a new server to a distributed software application[6]. Hundreds of small computers can be configured in a *cluster* to obtain aggregate computing power.

Obviously, vertical scaling is limited by the most powerful hardware available and it tends to be inefficient. In contrary, horizontal scaling provide much better performance at lower price[6]. Unfortunately, horizontal scaling is not a trivial task, mainly because of guarantees of consistency demanded by the ACID properties.

Simultaneously with this problem, there were issues with lack of availability and conceptual limitations of traditional RDBMSs (relational database management systems) from the new generation of web applications. At this point, database vendors and developers started to consider the idea that *availability* was perhaps the most important property of the systems, but they were struggling with what should be traded off against.

This dilemmawas presented as the *CAP¹ theorem*, which states that of three properties of shared data systems (consistency, availability, partition) only two can be achieved in any time [7]. This theorem was starting point in developing non-relational databases. In larger distributed and scaling systems consistency and availability cannot be achieved at the same time because of network partitions. Either we can have the system highly available, but in relaxing consistency, or to maintain consistency as priority and encounter unavailability of the system in certain conditions [8]. In both of these options it is on developer to decide and implement a solution in web application. There is a range of application that can handle stale data, and they are served well under these conditions.

The best examples are companies like Facebook, Google, Amazon, etc. They needed a database very high availability. Server failures could easily happen, and it is the goal of non-relational databases (commonly addressed as NoSQL databases) to increase availability and durability by duplicating data over many different data stores. In contrary studies have shown that traditional RDBMS have poor availability due to its strict rigid reliance on ACID properties.

III. NOSQL CONCEPTS

The term NoSQL was first used back in 1998 as a name for a relational database that omitted the use of SQL. After a decade it was reused as a naming conference organized by open source advocates to discuss distributed database systems. Today the NoSQL term is referred to a movement of the other database solutions than relational model. The expression is often interpreted as “Not only SQL”. The movement emerged as the solution for the problems when relational database model could not fit the data [9].

In contrast to relational database systems, most NoSQL databases are designed for easy horizontal scaling regardless of available hardware. Servers can be easily added or removed, or even crash without causing unavailability of data. This is due to the data replications on variety of servers. NoSQL databases have automatic sharding (most of them). Sharding is a method used in relational model in horizontal scaling to improve performance. Some relational database vendors advocate that RDBMS with right cluster configuration and sharding methods can overcome the problems in distributed systems, but the costs are dramatically escalating.As a

¹ Theorem by Eric Brewer from University of California, Berkeley

matter of fact, relational model should be used if data fits the database, and if not, or the performance in larger distributed systems is in focus, with a huge number of users, the non-relational model has to be considered.

A. *Motives for NoSQL*

The fact is that initially relational database models were designed for centralized deployment and not for distributed ones. Although clusterization support was added on top of them, synchronization is often not implemented efficiently but requires expensive protocols like two or three phase commit. Another difficulty which could eventually cause a problem is transparency in distributed environment. This means that application is not aware if it talks to a single server or a cluster, since all the distribution aspects are hidden from the application. Distributed application though, is following the assumptions of famous eight fallacies of distributed computing, which all prove to be false in the long run [10]:

- The network is reliable
- Latency is zero
- Bandwidth is infinite
- The network is secure
- Topology doesn't change
- There is one administrator
- Transport cost is zero
- The network is homogenous

In contrary most of NoSQL do not pursue this approach, but instead, NoSQL let the application be aware of the environment in which is run and maintained, and to leverage the right approach.

IV. TYPES OF NOSQL DATABASE SYSTEMS

NoSQL is not a name for one typical database. There are a number of different types of non relational database models. Enumerations of these types tend to vary, but what is now accepted as standard are: *Key/Value Stores*, *Document based Store*, *Wide Column Store* and *Graph Stores*. Each of these types is going to be discussed in the following chapters.

A. *Key/Value Store*

In Key/Value stores data can be stored in terms of a map and a directory. The concept is not new and it is well known in the theory of data structures in computer science where is commonly known as a dictionary or a hash map. In NoSQL database this concept is widely adopted because they promote easy scalability and flawless growth at rapid speeds. Databases that use Key/Value store use their namesake construct as the basic unit of storage. Key has to be unique to provide non-ambiguous identification of values. They are usually simple objects while values can be of different types like list, integer, string, float, byte arrays, or even hashes again allowing more complex data to be stored[11]. Key/Value stores allow the application developer to store schema-less data. This replaces the need for fixed data model and makes requirement for properly formatted data less strict.

Example of hash data stored as Key/Value is given in figure 2. Now, if this database is stored on distributed

nodes the application will just ask the distributed system for value looked up by unique key.

Typical operations which can be performed over Key/Value stores are well known to programmers of Hash Table implementations. Those are:

- INSERT – inserts new key and value pair
- LOOKUP – search operation, finds the value for the specified key
- DELETE – deletes key and the value associated with it

The simple models provided by Key/Value store allow working very fast and efficiently. The price for it is a reduced flexibility of querying possibilities.

Key	Value
Person_123	Name: John LastName : Doe Age : 45 E-mail : johndoe@email.com
Person_111	Name: Ron Age: 40 Likes : Books, Movies Knows : User_123 Car : Volkswagen
Book_101	Title: NoSql Databases Publisher: Some Publisher Inc. Year: 2011 Author: Person_123
ErrorMsg_01	MsgText: User not found
Order_252	Total Price: 300€ Item 1: Book_101 Item 2: Book_222 Item 3: DVD_045

Figure 2. Example of data represented in the Key/Value store. Stored values for every pair can vary of different data types, and doesn't need to follow the strict data schema.

Some of representative examples for use of Key/Value stores are Amazons Dynamo, Google's BigTable, and Cassandra which has been used by Facebook.

B. *Document Stores*

Document Store Databases are likewise schema-less where each document can have different sets of attributes. The structure of documents is similar to XML record. Usually JavaScript is used for data types and objects can, in fact, be written and read in JSON (Java Script Object Notation) format. Documents can also contain attachment which makes Document Stores useful for content management systems. Important facet of Document Stores is ability to address each document through unique URL, what makes them REST² friendly[11].

The main difference compared to the Key/Value store is that Document Store systems is aware of data stored in documents so JavaScript functions can be stored within the document itself. In that way all the processing can be done on the server side like querying data or even changing attributes.

² Representational State Transfer is a substitute for SOAP and WDSL

```

"firstName" : "John",
"lastName" : "Smith",
"age" : 45,
"address" :
{
  "streetAddress" : "5th boulevard 120",
  "city" : "New York",
  "state" : "NY"
},
"phoneNumber" :
{
  "type" : "home",
  "number" : "555-23-23"
},
{
  "type" : "mobile",
  "number" : "54-555-21-21"
}
    
```

Figure 3. Example of data stored in Document Store. Since the system “understand” the given format, some direct queries like “state” or “age” are possible.

Two main representatives in this category of non-relational database systems are MongoDB and Amazons CouchDB, which extensively relies on the MapReduce³ framework for data querying.

C. Wide Column Stores

Also known as Extensible Record Stores, Column-Oriented databases store and process data by column instead of rows. This technique has its origin in analytics and business intelligence where column-stores operating in a sharedparallel processing architecture can be used to build high-performance applications. Column oriented stores are seen less purist, also subsuming data stores that integrate column and row orientation. The main inspiration for column-oriented data stores is Google’s Bigtable.

An example of storing data in a wide column system using two-dimensional key is given in Figure 4.

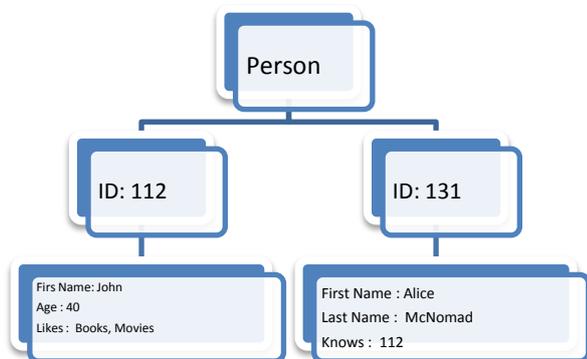


Figure 4. Example of data represented in wide column store. Here “Person” is used as a column key, and each person’s name as row key. Just like in Key/Value store, the value is not interpreted by the system.

D. Graph Databases

Graph databases are system where data is represented as graphs (figure 5). They are best suited for representing

data with a high, yet flexible number of interconnections, especially when information about those interconnections is at least as important as the represented data[12].

Graph databases allow for queries on the graph structure, e.g. on relations between nodes or shortest paths. Implementations of graph databases can support such queries efficiently by using well studied graph algorithms [13].

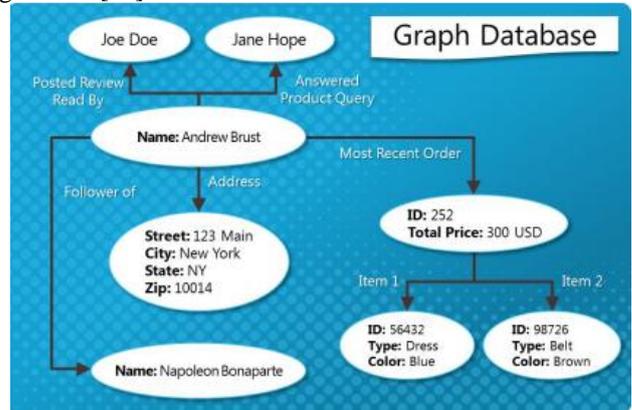


Figure 5. Example of Graph Database Store

V. E-COMMERCE APPLICATION WITH NOSQL DATABASES

In the past companies were developing their web-oriented e-commerce applications with relational databases using standard technologies like SQL language which required large investments and lots of effort in design. The company rightfully expected to remain competitive. However, today the world of e-commerce web application is changing in the way that early relational database developers did not predict. The application has to be built in a way to accept and handle very large number of users or customers. The traditional model has its limitations in distributed and highly scalable environment:

- Information has to be transformed from its natural representation into tables
- Columns of tables can only store similar data
- Relational systems are not built for scaling
- Joins between different record identifiers tend to be difficult
- Data has to be modeled into tables before storing
- SQL syntax is different in every RDBMS making it difficult to port application from one database to another
- SQL systems do not store and validate complex documents efficiently

As it was presented in previous chapters, there are different categories of NoSQL databases, but common pros for them are:

- Fast development
- No need for advanced logical data modeling or entity-relation diagrams
- Automatically scaling from single to multiple processors and hard drives
- Low failure rates
- More extensible

³ Programming model introduced by Google for processing large datasets in clustered environment

Considering that NoSQL is still new paradigm, large companies should be starting with a pilot program or application and move on with migration of existing ones. Startup companies however should consider implementing new technologies like cloud computing and NoSQL architecture.

A. Framework for e-commerce application in scalable environment

E-commerce web applications are very good candidate for NoSQL database implementation, because they usually start with some limited amount of data and smaller number of customers. But as the application become more popular and exploited the number of requests toward database dramatically increases. If the database is not distributed and there is no data sharding involved, waiting time extends, what eventually results in losing customers.

Taxonomy for implementing NoSQL paradigm in e-commerce web application can be:

- Aggregate and nested entities over joins
- Data duplication and denormalization
- Eventually consistent
- Sharding and linear scaling

1) Aggregation

One of the reasons why powerful transactional machinery is an inevitable part of the relational databases is that normalized data typically require multi-place updates. On the other hand, aggregation allows one to store a single business entity as one document, row or Key/Value pair and update it atomically[14].

NoSQL database uses soft schema which allows one to form classes of entities with complex internal structures (nested entities) and to vary the structure of particular entities.

Embedding with denormalization can greatly impact updates both in performance and consistency, so special attention should be paid to update flows.

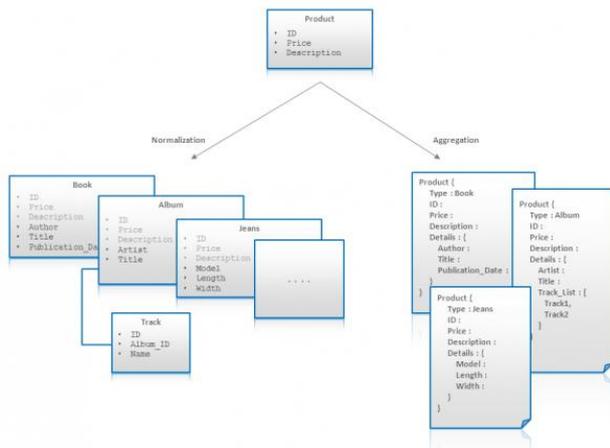


Figure 6. Example of entity aggregation in NoSQL database schema

2) Denormalization

Denormalization can be defined as the copying of the same data into multiple documents or tables in order to simplify/optimize query processing or to fit the user's data into a particular data model.

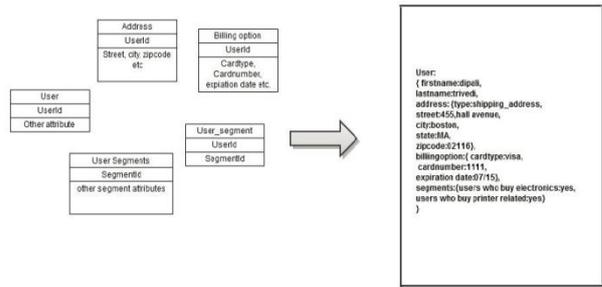


Figure 7. Example of denormalization in NoSQL database schema

3) Eventually consistent

Eventual consistency is one of the consistency models which can be described as consistency which is going to be achieved with some delay. In some cases this is not tolerable (above mentioned money transaction), but in majority of e-commerce web application, some inconsistency can and should be tolerated in favor of application performance and handling partition cases.

Traditional relational models are highly consistent but they render part of the system unavailable even though the nodes are up and running[8].

4) Sharding

Sharding is usually implemented in environment where we need to maintain I/O throughput of larger number of users simultaneously. In this approach application implements data partitioning for data spreading across the servers. Classic example is data of users who live on the east side of large state will be using servers which are geographically closer to them for storing and retrieving data.

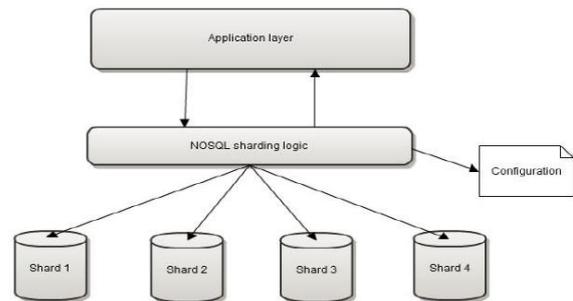


Figure 8. Example of Sharding in NoSQL database schema

B. Tools for NoSQL development

Among the great variety of free and open-source frameworks which can be used for database design and application development the famous are:

- Amazon DynamoDB
- Apache CouchDB
- MongoDB
- Cassandra

DynamoDB is a Key/Value database which is accessed through Amazon Web Services (AWS). This service is free to engage and is billed on monthly usage of storage and I/O of data. The database uses the eventually consistent model explained above.

Apache's CouchDB is most known document-oriented database. It defines a basic Key/Value storage mechanism, the target of which is the storage of documents in JSON

(JavaScript Object Notation) format. The storage engine supports ACID properties and REST access. One of the interesting functionalities of CouchDB is a down scale, which is to have an implementation that can run in the context of mobile phone, a web browsers, etc.

MongoDB is a similar project to CouchDB but doesn't support the ACID and REST properties, but has much more robust query engine very similar to SQL.

Cassandra is a Key/Value store initially used by Facebook. It uses the column families to define data, and adds the concept of "super columns", which are essentially repeating columns.

VI. CONCLUSION

The aim of this paper was to give the introduction to the NoSQL database movement which was developed in the last years as the alternative for predominant relational model. The goal was not to prejudge the winner in the battle of two paradigms, but to help CIO's to adopt new technologies when it is proven that it will improve business. NoSQL will challenge IT management, technical stuff, analysts and product developers in many ways. But if they grasp the opportunity they'll find many ways in which they can provide agile, high-performance solutions to business challenges that simply cannot be addressed in tables. These systems include document stores, Key/Value stores, graph databases and wide column stores. Organizations that provide applications with only SQL persistence will increasingly be under pressure from their unhappy partners for their rigidity and constraints.

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Risk Assessment Metrics in Information Technologies Audit

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Abstract - There are numerous methodologies for carrying out IT (Information Technologies) audits, as well as creating numerical representations of the audit assessments. The numerical representations always have to rely on the personal assessment and somewhat subjective views of the auditors, thus cannot become totally objective. On the other hand, the uncertainty in the accumulation process – the numerical representation of the audit observations – can be diminished. In the research a modified correlation matrix of the risk factors has been created, to better represent the effects on the overall risk level. With the help of a more objective risk assessment method, IT-management decisions and the allocation of resources concerning information systems can become more effective.

I. INTRODUCTION

Without timely and accurate internal control information system, management will not be able to regularly direct the enterprise. If we don't realize the advantages of internal control information system on time, there is no other option but to stumble on it. Information, practice and knowledge must be coherent all the time to avoid gaps between them or their obsolescence. Therefore, executives in well-conducted enterprises tend to maintain their skills and knowledge and to ensure information flow, and management tries to support them so that the enterprises could function as better as possible. That is one of the roles of internal control information system. Therefore, the role of information and ICT (Information and Communication Technologies) in everyday life has been growing constantly in the last decades. Computers and computerized information systems are used more and more every day. The change has been even more radical in business applications. Computerized information systems became widely used for information processing and storage and most organizations in these days use computer systems for their business information needs [4]. As most business data are now stored in computer systems it has become clear that although ICT is an enabler for effective company business, it also presents new types of risks. Therefore, security of the computer information systems and more precise ways to assess their risks has become highly important. The fear of corporate accounting scandals, terrorism, climate change and biological threats has also raised the level of alertness and concludes in a need for more efficient risk measures.

The common way to certify the risk level of business

information systems is IS or IT auditing. The information systems (IS) audit is a process during which data and facts are collected to assess the protection of information assets, data security and to check whether the computer systems enable effective ways to obtain the goals of the company and efficient use of its resources [12]. One of the main goals of IS to identify the risks threatening the company's computer information systems, Audit reports also contain a usually limited risk evaluation, based on the data collected during the audit process. Most of the times these evaluations are based on the auditor's perceptions, and represent a point of view on the risk factors and their measures.

The corporate accounting scandals resulted in the Sarbanes-Oxley Act (SOX) in the United States in 2002 and the revision of EU Directive 8 during the last years. Both regulations have the same goal: to restore the trust of investors for corporate accounting reports. Integration of information technologies (IT) and business processes imposes the necessity for assurance in the reliability of IS. Increased requirements for control over information are understood as enterprise management key components. These results supplement the internal control framework which provides required information for the enterprise to achieve its goals. Accordingly, information system needs to be brought under control. It means that IS internal control goal represents the reduction of operational errors. In such a way financial reports are more reliable, enterprise risk management is more likely, and the enterprise equity is safer. This situation contributes to the synergy of internal control and enterprise management places it under solid framework. They contain strict regulations on responsibilities for audit reports, the personal involvement of stakeholders, the total independency of audits and other sensitive issues. Many of the companies' processes must be revised and the responsibilities for audits are more precisely defined [15]. These efforts show the growing need for reliable audit data; and the importance of auditing in general and especially IT auditing seems to be growing rapidly.

II. THE RISK MANAGEMENT PROCESS

Internal control for the enterprise is same as self control for the individual. In contemporary business conditions, management agrees that each enterprise entails risks to be controlled through policies,

instruments, personal responsibilities. It is necessary to establish IS internal control standards; define and develop detailed policies; establish levels of risk tolerance and ensure that enterprise has identification, measurement, monitoring and reporting system for all types of exposure.

For many, enterprises, information and technology that support operation of the company represent the most valuable asset. Consequently, successful enterprises recognize advantages of information technology and understand its association with risks management as a critical dependence of many business processes in relation to information technologies. They understood the value of IT management and set increased requirements of the internal control, in particular of the IS control. Successful business management practice is impossible without the existence of internal controls system, and the key part of the internal controls system are the IS controls that should be continuously evaluated. Thus, IS internal control obtains an important place in management structures, and the corporate risk management becomes a priority for modern business.

Risk management is the process that guarantees that the strategic objectives of the company are not endangered by the failures of IT in the organization. The impact of an IT failure can be catastrophic whether it results in an operational crash, a security leak, a project collapse or other management issues. Executives have to understand that IT risks are not only a question of technology, but also a factor that can endanger investments and projects. A common mistake is to overestimate security risks and not to take effective measures against IT-related management or project risks. It is important to understand that: Risk is as much about failing to grasp an opportunity as it is about doing something badly or incorrectly [11]

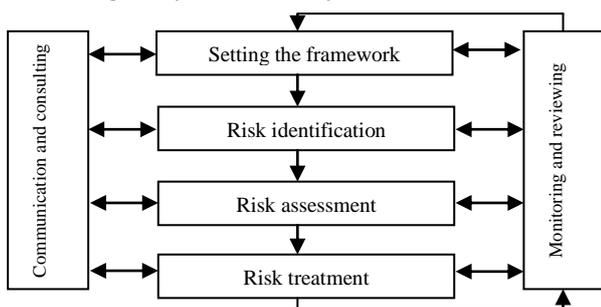


Figure 1. The Risk Management Process

Although in some of the literature the definitions are different – like in IRM’s model [6] most sources agree that the risk management process is made up of three major steps: risk identification, risk assessment and risk treatment (see *Figure 1.*).

There are many methods to identify risks, e.g. objective-based or scenario-based identification. By the use of these methods a more or less comprehensive catalogue of relevant risk factors can be obtained.

During the assessment phase the previously identified

risks have to be assessed by their severity, impact, potential caused loss, probability etc. In most cases risk assessment is a great challenge as it has to be made depending on limited information.

These risks must be treated according to assessment. The treatment can be either transfer, avoidance, reduction or acceptance [3]. In the research IS risk assessment has been in the focal point as this is the most critical step in the process. Risk assessment has to deal with many uncertainties and its final assumptions have an important role in making the decisions on risk treatment.

III. THE NEED FOR ASSESSMENT METRICS

There has always been a need from the management of the companies that were investigated that the results of the audits should be represented in numerical ways. The precise measurement of IT-related risk would have multiple benefits for most companies.

IT-management decisions concerning the allocation of company assets and efforts can be put on a reliable basis. If the risk factors are identified and their levels are precisely measured, it becomes much easier to focus on the most important issues and to concentrate company spending on the selected subjects. Company assets are always limited, and the amount of money that can be spent on risk defense is usually restricted. A method that could identify the main risk factors and measure their possible impacts would allow the allocation of these resources in the best possible way, and it would make the optimization of spending possible. Companies are always interested in comparing themselves to other organizations in the same industry. It is beneficial also from a promotional point of view to have certificates of the effectiveness of the company’s risk management. For this purpose benchmarking can be used. To establish a reliable benchmarking system, and unbiased risk assessment method is needed to allow the interchange between different assessments, carried out by different auditors in various circumstances.

To obtain these goals a proper measurement system, metrics is needed. Establishing risk metrics would help organizations by giving a basis for risk analysis and assessment that „...would enable them to make business decision about managing security risks“. [14]

A. Challenges of IT Risk Assessment

The efforts of the past decades to create a standard measurement system for information security risk show that creating a risk assessment methodology and metrics is a huge challenge.

Risk assessments can be qualitative or quantitative and both approaches have their advantages and shortcomings. Naturally, the goal of risk assessments is to provide a precise and reliable measurement of risks. Therefore the quantitative approach would be ideal. On the other hand many of the methods presume that correct numerical representations of the measurements cannot be given, so they use subjective scales. Usually these are

rankings of the extent of risks (e.g. low risk, medium risk, high risk) based on subjective assumptions.

The benefit of the quantitative methods is that they naturally create numerical representations of the risk assessment and therefore can be easily used to support IT-management decisions. The main difficulty is to collect the necessary data. In many cases it is impossible to measure the level of risks, the probability of occurrences or the potential impact of the threats. All that can result in forced numerical representations for the basic data and the final outcome based on these data can be deceptive. Although the assessment report can contain detailed numerical data on the level of risks the usability of assessment is questionable. It might be even worse to have an assessment report with precise-looking numerical risk levels that are misleading than to admit that some parts of the assessment cannot be characterized with numerical values.

Even if the numbers are correct it is extremely difficult to compare the effects of a highly unlikely event with a great impact factor with a very likely but not too serious event. Another problem is the comparison of data on different scales. Especially, it is extremely hard to compare management risks with the risks of technical failures. Therefore quantitative methods usually concentrate more on the technical aspects that are more or less measurable and pay less attention to management issues.

A further obstacle is that most assessment methods do not cover every aspect of the IT-related control issues. To create a comprehensive assessment many methods have to be used and the comparison of the results of different topics can be questionable.

Furthermore most of the assessment metrics do not take into account the interactions of the different risk factors. Simply adding the different risk levels can be misleading even during a limited survey.

Due to the problems mentioned above a combination of the qualitative and quantitative approaches is needed. According to the ITGI survey the most popular risk assessment techniques are still the business impact and vulnerability-based approaches, but companies are beginning to realize the importance of a broader toolset. Assessment against control objectives and best practices is becoming more popular [11]. This Means that management is beginning to realize that a comprehensive risk assessment can only be carried out if all the aspects of IT-related risks are taken into account. This goal can be obtained by combining assessment against best practices and assessments of business impact and likelihood.

There is no unique way which defines information systems control organizational structures. Each enterprise should use the most appropriate components of these frameworks to categorize and assess IS controls. In the modern environment is not possible to imagine any audit form (financial reports audit, internal audit and public

sector audit) without considering internal controls that are embedded in an information system which is audited. Auditing procedures for the internal control evaluation cannot be based on intuition, already certain methodological rules must be followed. Therefore, there is a need to develop internal control audit methodologies that are performed through the information system based on the level evaluation in which those internal controls meet predefined control objectives. Beside considering client's information, methodology development itself includes audit content planning along with selection of processes that will be subject of audit. That represents input values for risk assessment, control objectives and existing controls whose performance needs to be verified through implementation of audit procedures and results analysis of the audit tests conducted. This way information system internal controls evaluation enables the adjustment of enterprise to risk environment. By using COBIT (The Control Objectives for Information and Related Technology) framework the gap between business risks, control requirements and technical issues will be bridged.

To make an assessment against control objectives, the most comprehensive set of IT audit best practices, COBIT is a methodology that has become a de facto standard covering all possible aspects of IT governance.

B. Aim of the Research

During auditing projects users face the problems mentioned above. Although clients would expect a precise and well-interpretable result of the risk assessment process, it is extremely hard to create one. Most of these problems are yet to be solved. There have been initiatives to unify the different approaches to risk assessment [9] and hopefully the convergence of risk management methods has begun.

The goal of the research is to diminish assessment errors in the calculation phase. Therefore data collection or the method by which the input data are created has not been targeted. It has been assumed that the necessary data for the assessment is available and had been created during an IS audit process by the auditor. The goal is to create a tool for IT auditors that helps in making the assessment and enables better usability. The result of the assessment method is a unified risk level indicator that is based on the results of the IT audit. The different risk issues are dealt with as additive or subtractive factors.

During the research COBIT control objectives have been used as a basis to create the necessary risk factors. As COBIT covers all possible areas of IT governance it is a sensible assumption that the risk factors identified using COBIT methodology are representing the most comprehensive set of aspects.

COBIT offers a Maturity Model to assess the maturity or the level of development of each of the control objectives. This is based on the commonly known CMMI (Capability Maturity Model Integration) method developed by the Carnegie Mellon Software Engineering Institute. Although maturity levels are subjective as it is a

personal responsibility to make the assessment probably this is the best way to avoid suggestion of a precision that is not justifiable [2] COBIT contains Maturity Models for all of the 34 IT processes to cover all aspects of IT-related governance.

The application of the method is rather simple as the main goal was to provide a tool for self-assessment. The levels of maturity – or how well-formed the respective processes are – can be grade on a scale of 0 (non-existent) to 5 (optimized). Generally this method is a qualitative approach but can be used to create well-established numerical results. Naturally, as the maturity levels are measured on an ordinal scale the results cannot be interpreted directly.

The maturity levels can be used to make a distinction whether a risk in the organization linked to the control objective adds to the overall risk of the IT-related issues or decreases it. Based on the maturity levels an assessment method can be developed. The obtained results can be used for benchmarking purposes, as a standard for unbiased comparison and as a helpful tool to establish good IT-management decisions.

The research is focused on the interaction between different risk factors. This is the aspect that can be improved as most methodologies do not concentrate on simultaneous effects. It is important to realize that the simultaneous effect of two or more risk factors can be different than the effects added together.

In the assessment process it can be decided whether the maturity of a control objective will raise or lower the overall risk. Then it would be comparatively easy to

calculate the overall risk level. But the interactions have to be taken into account as well. During the research the interactions of risk factors – according to COBIT Control Objectives – has been mapped. A correlation matrix has been set up to determine the co-effects of the risk factors on overall risk level.

The matrix shows the simultaneous effects of two risk factors on overall risk level – or security level as „+“ stands for more security and „-“, for less security. The top left cell in each segment shows the simultaneous effect if both factors are considered to perform well, the bottom right is to sign the effects of both factors underperforming (see Figure 2.).

		AI 1	
		+	-
PO 4	+	+	0
	-	+	-

Figure 2. Example for the cell contents

The most critical part is the diagonals of each segment as the simultaneous effect of two risk factors on overall risk level can be different depending on the types of risk and their interaction. To co-effects in the modified correlation matrix are results of previous experiences and professional estimates. It offers a simplified representation of first-order relationships between different control objectives, thus the risk factors as well. In this early version the relationships are only mapped between high level control objectives and the assumption has been made that detailed control objectives relate to each other analogically to their parent (see Figure 3.).

domain id	id	PO	AI																				
	1																						
PO	1		+	-	+	-	+	+	+	-	+	+	+	+	0	+	-	+	-	+	+	0	
			+	-	+	-	+	-	+	-	-	-	+	-	+	-	+	-	+	-	0	-	
PO	2				+	+	+	0	+	+	+	-	+	-	+	0	+	-	+	+	+	-	+
					-	-	0	-	-	-	-	0	-	-	-	0	-	-	-	0	-	0	-
PO	3						+	-	+	+	+	0	+	0	+	-	+	-	+	0	+	-	+
							+	-	-	-	0	-	0	-	+	-	+	-	0	-	0	-	+
PO	4								+	+	+	0	+	0	+	0	+	-	+	-	+	0	+
									-	-	-	-	-	-	-	-	-	-	0	-	0	-	+
PO	5										+	-	+	-	+	0	+	-	+	-	+	-	+
											+	-	0	-	0	-	+	-	+	-	+	-	0
PO	6												+	-	+	-	+	-	+	0	+	-	+
													-	-	+	-	+	-	-	-	-	-	+
PO	7														+	0	+	-	+	0	+	0	+
															-	-	+	-	-	-	0	-	0
PO	8																+	-	+	-	+	-	+
																	+	-	0	-	+	-	+
PO	9																		+	+	+	+	+
																			-	-	-	-	-
PO	10																				+	-	+
																					0	-	0
PO	11																					+	0
																						-	-
AI	1																						

Figure 3. Part of the modified risk correlation matrix

IV. THE RISK ASSESSMENT METHOD

Based on the correlations detected in the earlier stages a risk assessment method can be set up. The overall risk level of the organization can be measured in the following way:

$$R = w_{12}r_{12} + w_{13}r_{13} + w_{23}r_{23} + \dots + w_{(n-1)n}r_{(n-1)n}$$

where R is the overall risk level, $w_{12}, \dots, w_{(n-1)n}$ are the weights of the respective risk factors and $r_{12}, \dots, r_{(n-1)n}$ are the first-order correlative effects of the risk factors (+1, 0 or -1).

The weights of the correlative effects are created from the weights of individual risk factors given by the auditor or the person making the assessment. The weights should add up to 1 and should represent the same distribution as the original weights of individual risk factors. This can be guaranteed by a simple calculation in the first phase of the assessment.

This method creates a risk level index in the range of -1 to +1. The aggregation can be made for the whole of the risk factors or only certain control objectives; therefore it is possible to create risk indicators for different territories as well. By creating a well-defined index of the overall risk level, it is possible to make comparison between different companies or different functional territories within the organization.

Naturally, this method is not the ultimate solution to risk assessment. By taking into the account the interactions of risk factors it is possible to make more precise assessments and create metrics for comparable results. In this method only the first-order correlations are taken into account. The effects of multiple correlations on the result must not be underestimated but the secondary, tertiary etc. correlations are expected to have less effect on overall risk levels.

The method does not solve the problem of data collection. It is designed to rely on the maturity levels defined by the auditor. The goal of this method is to lessen the effects of errors made during the aggregation process.

V. CONCLUSIONS

A well-formed risk assessment technique can have multiple benefits to many of the stakeholders of IT-related risk management. The metrics that results in numerical representation of the risk levels of company IT can serve as a basis for benchmarking. Therefore it is possible to make comparisons to other companies' risk measurement can be used in certifying the level of risk-readiness. The value of a proper certification of the level of risk the company holds is very high. The certificate can be presented to the clients as an instrument to assure confidence.

A reliable assessment of the information risks is an especially powerful tool in the hand of the IT-management to establish their decisions. The assets of companies are always limited; therefore a method that

enables the best allocation of money and attention is always welcome. By identifying the most problematic areas and offering a precise measurement system of the level to which the area is exposed to threats it is possible to make well-founded decisions on expenditure and risk-related actions in the organization.

Taken as a whole, risk assessment metrics can help in drawing the attention of the stakeholders to the problematic areas and also to take countermeasures in the most effective and cost-efficient way.

The research development aimed to create a more reliable assessment method to process the statements of the IT audit report. For this purpose the effects of simultaneous existence of risk factors have been taken into account.

Several challenges still lie ahead of authors in creating a common method for IT audit risk assessment. A common approach is needed to assure that the different organizations using different standards can cooperate and the results are interchangeable. The efforts of the main organizations undoubtedly show the determination to create common methods. The largest challenge is to collect the necessary data for a reliable risk assessment. In most cases this appears to be beyond possibility. The problems mentioned earlier – e.g. comparing different scales and diverging events – might prove to be overwhelming. Nevertheless efforts can be made to create a basis for assessments.

Another type of challenge is the handling of the assessment process itself. A common mistake is to add the different risk elements and calculate an overall risk level by simply totaling the individual rates. This results in misleading numerical representations and unjustified outcomes. During the research in this paper this kind of error has been targeted. The mapping of the first-order correlations between control objectives has been done. We found out that the tasks lying ahead are:

- Mapping multiple correlations (co-existence of several factors) and their effects on overall risk. The simultaneous effects of more than two factors have not been targeted yet. The consequences can be significant but are expected to add up to less than the first-order correlations.
- Discovering the correlations between detailed control objectives. During the research correlations have only been checked at a higher level. The assumption has been made that the detailed control objectives inherit the correlations of their parent-objectives. This hypothesis has to be checked and the model has to be revised according to the results. Individual checking of control objectives would mean almost 100 000 relations which is an enormous task.
- Creating a software-framework to help the actual usage of the method in real-life situations and help auditors apply the findings.

Although the first steps to establish risk assessment metrics and create more reliable methods for IT risk

assessment have been made there are still several difficult problems to be solved, which will be the next task for the authors. Large effort is needed to solve some of these, but the expected results compensate for the endeavor: Reliable IT risk assessment metrics would raise the precision of the evaluation of IT risks, the reliability of IT audit findings, the validity of IT-management decisions and the effectiveness of the allocation of IT-related assets.

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Information Systems Framework Synthesis on the Base of a Logical Approach

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Abstract - We consider an approach to the information system framework synthesis. This approach implements OMG's Model Driven Architecture transformation on the base of combination of logical and imperative programming languages. Information system is modeled using UML Class Diagram. The transformation procedures are represented as rules and source code templates. The generated framework is a set of source code modules, which form libraries for further development. An example of approach application and further improvement of the transformation implementation are considered.

I. INTRODUCTION

Information systems (IS) at present are constructed on the base of a common scheme, where IS consists at least of the following three subsystems:

- *Data Warehouse (Storage)* provides persistent data layer for program objects, storage formats, and productive access to the stored data.
- *Application Control Layer*, which usually is referred to as business-logics layer; it is a domain object interaction model implemented as a program. The layer mainly realizes changing the warehouse data, providing the soundness with respect to domain.
- *User Interface* represents stored and processed data for users and propagates events initiated by users to application control layer.

Most of the information systems also have analytical and report generation subsystems.

At present there are popular approaches used in construction of complex IS, rising development performance, namely

- Component architectures and environments, which allow high code reuse,
- Visual modeling of various aspects of the project under development followed by a code generation.

Complex environments such as SAP R/3, JavaBeans, EJB, CORBA, COM/DCOM/ActiveX, .Net are examples of the first approach. Their libraries include professional grade relatively abstract implementations of key

subsystems. Developers combine and specify predefined behavior of the library modules to the problem domain. We consider that Rapid Application Development (RAD) systems belong to the component environments. Famous examples of RAD-systems are Borland Delphi/C++ and their contemporary derivatives, as well as Microsoft Visual Studio.

Visual modeling techniques, e.g. Computer Aided Software Engineering (CASE), allow one to deal with complex systems and projects, representing them as an abstract formalized model. CASE-systems use UML to model IS implemented in object-oriented programming and storage environments. CASE instrumental software has code generation routines to convert visual models into source code modules. Usually, the generation routines are mutually independent and represent a viewpoint of CASE-system manufacturer to the process of the visual model representation. There is no standard approach to user interface generation in popular CASE-systems.

Visual modeling is intended for takeover the complexity problem during software design and manufacturing, as well as it is a way of formalized communication between developers and customers. Model Driven Architecture (MDA) [1] is a further development of CASE-system aimed to provide solution for the following problems of IS development:

1. Rapid development of software construction technologies and programming techniques, results in frequent change of software development platforms and accumulation of legacy source and binary code.
2. Necessity to support a number of parallel versions of the software on various hardware platforms and operating systems; for example, most of popular Internet services have applications for mobile platforms (iOS, Android).
3. Reuse of models and corresponding implementation source code in new projects, and accumulation of formalized knowledge on designing and implementation of IS subsystems.

Key concepts of MDA are CIM, PIM, PSM, and PDM. *Computation Independent Model* (CIM) reflects software's external requirements – its interfaces. CIM hides internal structural elements, and therefore can be used to define specifications and checking requirements.

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Platform Independent Model (PIM) is a model of the software reflecting most of the structural and some semantic aspects of the software, but this model contains no information about implementation of the structures on the target program architecture. UML Class Diagram which is extended with some tag values and additional stereotypes is a relatively common example of PIM. The extension (marking) allows one to denote implementation nuances for structures. *Platform Specific Model* (PSM) is a model, which can be implemented as a source code of the subsystems, e.g., it could be a physical structure of a relational database, which is directly (algorithmic or by means of code templates) translated into DDL SQL-requests.

MDA formalizes part of *Software Life Cycle* concept [2], which reflects a path from domain to results of implementation stage (see fig.1). Initially an *idea* of a program is proposed. On the first step basic terms and functionality requirements are iteratively collected, which correspond to MDA's CIM. The next step is a requirements analysis, which results in forming a *general project outline* corresponding to PIM. The developer's design activity results in *detailed system design*, i.e., PSM, followed by the implementation stage of the software components.

MDA is a methodology for developing software by means of partial automatic source code generation of IS from visual models, so it can be considered as an approach to generative programming [3,4]. The main distinction from generic CASE-systems is that the code generation routines are not fixed and can be extended and adapted to the project requirements and developers' way of structures and functions implementation. It can, e.g., be adapted to describe even IS based on component architectures.

The transformation of the PIM into PSMs is carried out under control of a Platform Description Model (PDM). PDM contains information and algorithms of PIM's structure analysis and generation of corresponding data structures in PSMs. Sometimes PSM is understood as specific variant of PIM. The tag values and stereotypes are used to direct the transformation of PIM's structures into certain frames.

The aim of our research is to create a complex

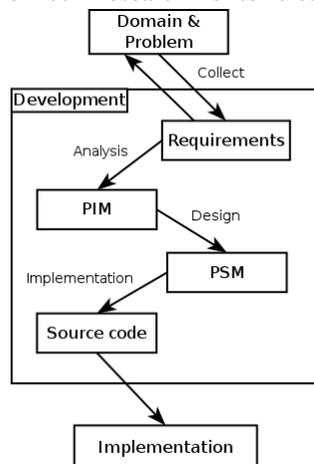


Figure 1. MDA reflects the Software Life Cycle integrative MDA technology to support designers and

programmers with flexible transformation technique, which is by nature adaptive to their peculiar way of software development. Especial interest for us is adaptation of the MDA to extreme and agile programming. This paper devoted to consider our experience of an approach to transformation implementation based on substantial use of a local language and rule-based inference systems.

II. TRANSFORMATION IMPLEMENTATION

There are a number of approaches to the transformation implementation. Algorithmic approach, where all the transformation procedures are implemented with an imperative programming language; XSLT transformations allow to represent transformation as production rules; graph theory and graph transformation; usage of domain specific language [5]. We use logical approach to define transformation as a set of productions and a pattern-directed inference engine [6] and a transformation scenario.

Patterns are represented as a mix of Prolog and Python programs. Pattern query is a Prolog rule located in so called `__doc__`-strings of Python instance methods. The bodies of instance methods are execution parts of the patterns. Parameters passed to the methods are results of corresponding pattern queries inference. Instances itself are modules, i.e. a set of patterns and algorithms that transform part of PIM into a part of PSM. Consider the following example of patterns which are supposed to recognize and generate SQL query to create relational database table for storing object instances of IS under development.

```

class RulesMixing: # Set of patterns
    def rule_primitive_class(self, cls, oid, oidType):
        # figure out the basics of relation coding
        # in relational tables
        """ % this starts __doc__ string
        primitive_class(Cls, OidAttr, OidType):-
            element(Cls, 'Class'),
            \+stereotype(Cls, 'abstract'),
            stereotype(Cls, 'OODB'),
            \+internal_only(Cls),
            stereotype(Cls, 'primitive'),
            attribute(Cls, OidAttr),
            type(OidAttr, OidType),
            stereotype(OidAttr, 'OIDkey'),!.
        """ # this ends __doc__ string
        self.BASE_CLASS = cls
        # we found the root of the class hierarchy
        self.BASE_CLASS_NAME = self.getName(cls)
        self.OID_NAME= self.getName(oid)
        # attribute for object reference
        self.OID_TYPE = self.coerceAttrType(oid, oidType)
        # choose a type for the object reference
        return self.BASE_CLASS_NAME, cls, oid,
            self.OID_NAME
        # the values are passed to a for statement.
    def rule_persistent_class(self, cls):
        # a class is persistent if its instances
        # are to be stored and it is not a type.
        """
        persistent_class(Cls):-
            element(Cls, 'Class'),
            \+stereotype(Cls, 'abstract'),
            stereotype(Cls, 'OODB'),\+internal_only(Cls).
        """
        # this pattern has no body
        .
        .
        .
class SQLTranslator(Translator, RulesMixing): # a module
    # it generates SQL-script of database structure
    def genClass(self, cls):
        # Generate SQL-script for a class cls
        answer = [] # list of source lines
  
```

```

if cls in self.generated: # is it already
    return answer # generated?
for _, parent in self.query('class_parent',
    (cls, '#')): # generate all ancestors
    . . . . .
name=self.getName(cls) # name of the class
doc=cls.getDocumentation() # documentation
if doc: # is it not empty?
    answer.append('/*\n%s\n*/' % doc)
attrs = self.genSchema(cls)
# generate table attributes
if not self.isEmpty(attrs):
    answer.append("CREATE TABLE %s (" % name)
    answer.append(attrs) # table attributes
    answer.append(") %s;" %
        self.getTableType(cls))
else:
    print "The class has no attributes."
self.addFact("oodb_table('%s', '%s')" %
    (cls.getId(), name)) # assert conclusion
# on a relation of class to table
self.generated.append(cls)
return answer # return generated code
    
```

Method *genClass* is executed from outside for each answer *Cls* of *persistent_class(Cls)* query. Structure of the base class, recognized by rule *rule_primitive_class*, greatly affects a way of object references representation of the rest of the relational database tables.

This approach has cumulative advantage over above mentioned techniques: expressive production-like transformation representation, powerful imperative and retrospection abilities of Python, existing template engines used in Python web frameworks, and it is a tool, which is not tied to specific set of development environments.

We develop a software designing technique for MDA based on multistage transformation of PIM into a PSM consisting of specific submodels (fig. 1). To transform the UML models its XMI (XML Metadata Interchange) file is loaded. This format is a kind of XML, so DOM2 API is used to access PIM's structure. XMI is a standard data format supported by various proprietary and free software technologies and libraries. The DOM2 tree is translated into Prolog facts by means of requests from patterns. Object Constraint Language (OCL) expressions are extracted from PIM and represented as syntax trees.

At first a general reasoning about object structure is carried out, basic properties are recognized. Other modules use the reasoning results to refine implementation variants of synthesized program objects.

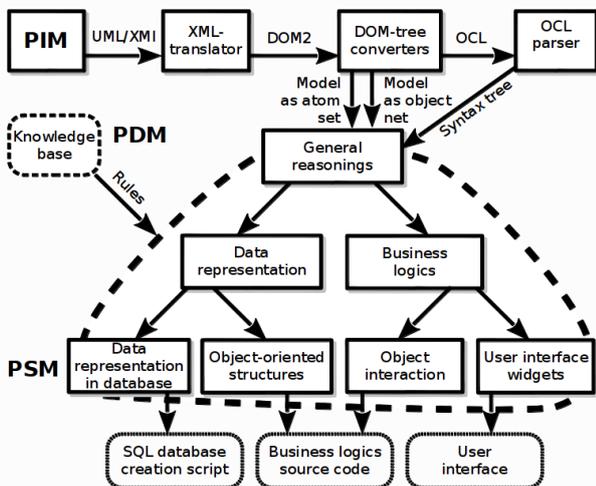


Figure 2. Architecture of transformation engine

Each module specifies PIM's structures with additional facts about existing structures and creates new objects and relations. For example, SQL database transformation module merges inherited abstract part of attributes to the class and generates table description on the base of the merge. The process is controlled by scenario represented as a list of leaf nodes to be executed. If all nodes of the scenario are executed and all their solutions (queries) are satisfied and processed, then the set of all the facts in working memory defines PSM. The source code is generated on the base of obtained PSM. A generator module executes a query and fills in a source code template with query results.

Results of transformations and code generation are combined in object libraries. Objects from libraries are used in construction of business-logics of developed IS. Programmers supplement generated code by inheriting it in new classes. This approach partially solves the problem of generated source code modification by programmers.

The XMI file can contain not only the structure information, but also some semantic values for its elements. This information used to increase the control over the transformation procedure, in particular, for filtering information by using some criteria. UML have the following semantic definition language structures:

1. Stereotypes to create new elements of UML;
2. Tagged values to create properties for the elements;
3. Constraints to formally define logical constraints, invariant, pre- and postconditions for a method invocation.

Let us consider a simple example. Assume that there exists a class in an UML Class Diagram that has at least a string field *name*. If we mark the class with, e.g., «Reference Book» stereotype, then all many-to-one relations to the class can be interpreted in relational database context as many-to-one relation and corresponding tables, and reference fields *ID* are generated. Having recognized the stereotype and the relation, user interface generator can construct a widget and its controller (in sense of Model-View-Controller paradigm) to select appropriate record from the reference book and store the reference book *ID* in corresponding table and object. Now, the generated code in various subsystems is logically and mutually depended.

In order to adopt the transformation engine and its knowledge base to developer's instrumental software and technologies, one imports Python module, inherits and modifies its set of patterns and generation modules, specifies new module in scenario. In the application example in the following section we used inheritance to refine a generic SQL relational table transformation to specific properties of MySQL server.

III. APPLICATION OF THE TECHNIQUE TO CONSTRUCT A FRAMEWORK OF AN INFORMATION SYSTEM IN MEDICINE

In 2005 we applied our transformation engine in the life cycle of medical IS named "Population cancer registry" development for recording cases of cancer

incidence in Irkutsk Regional Oncology Center (hereafter hospital). The IS was to accumulate data on the cases happened in Irkutsk Region (Irkutsk Oblast). The territory is about 768 000 km², and its population is about 2 500 000 people (2011); every year around 8000-9000 cases are recorded. The necessity of the development is dictated by Ministry of Health and Social Development of the Russian Federation by a corresponding directive in 1999.

Previous version of the IS was based on Microsoft Access'95 and designed as stand-alone applications with common server database developed since 1999. As in 2005 there were no high bandwidth channels to the hospitals subordinate clinics and oncology medical offices, as well as most of the offices were not connected to Internet at all, the input data came to the clinic as filled in printed forms by regular mail or with courier every month. Then all the forms were recorded into database by stuff of organizational-methodical department of hospital. The IS and operating system peculiarities did not allow the usage of the system for medical doctors directly in their offices: response time of IS was very low and there were no obvious ways of overcoming that problem; the system had also closed proprietary design.

In that time Russian government began to support a number of programs of development, including digital medicine and communication channels quality and productivity improvement. In the same time Internet technologies and software as a service started to dominate on market; a number of open-source technologies become mature. Hospital and regional administration decided to realize new version of IS, which are to be the international platform of network infrastructure accumulating all oncology data streams from various medical information systems in the region. There was also financial support in amount of 10 400 euro for the initial state of the project.

Initial condition to the IS development was somewhat indefinite: there were a diversity of hardware and software (out-of-date personal computers and operating systems); structures of input documents though were approved by the above mentioned decree, but they were informal; there was a lack input data to required report forms; also there was no standard strategy of IS implementation as an application for user. In this situation we decided to organize development mostly on an abstract level, which would allow generating frameworks for randomly appeared new requirements.

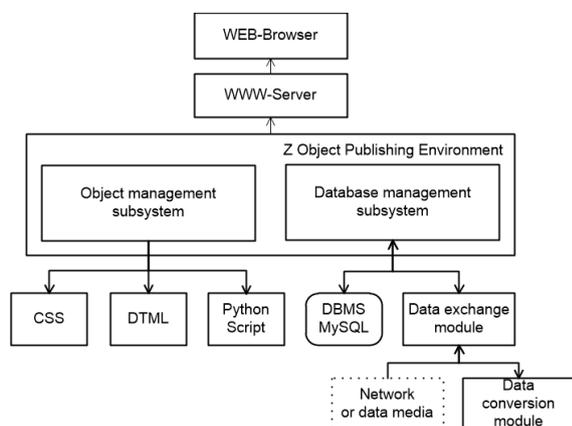


Figure 3. Architecture of Population cancer register medical IS

As the UML editing tool we used Gentleware Poseidon for UML Community Edition v. 3. The IS's PIM was presented as the marked UML Class Diagram and contained more than 100 classes, interfaces and other auxiliary structures. PIM represented whole class/instance, records and enumeration structures. Most of the classes were marked by «OODB» stereotype to be stored in relational database MySQL-4.1 as objects. Some of the classes were marked as «Reference book». Records represented joined lists of attributes, which were included in class as a complex structural attribute (e.g. passport data), but stored in the same table as their class. Enumerations are structures, whose attributes used as constants in database, business logics code and user interface.

Attributes of classes were marked with various tag values. For example, tag value "name" denote a notation of the attribute in user interface forms, "index" (true or false) suggested to the transformation engine to add an index in database definition for the attribute; "index_kind" (btree, hash, etc.) refined the variant of index engine; set of "widget:..." tag values controlled variants of attribute user interface representation. By means of the tag values we denoted the storing engines for persistent classes, grouping attributes on user interface forms, the layout was implemented manually.

As target platform the following software were chosen: Gentoo Linux OS; MySQL-4.1/5.1 with InnoDB and MySAM engines as relational database server; object-oriented Internet application framework Zope-2.7.3 and Python programming language as business-logic implementation environment; XML as data presentation format. Transformation engine has about ten modules; each module has about ten original (noninherited) rules. In fig. 3 architecture of the IS is presented.

The constructed transformation system has generated a complete DDL script for database, representing all the classes as objects referring each other through object identifier OID and some of retrospection instance data (inheritance between classes); complete set of business-logics Zope objects represented as Zope folders with full support of contexts; complete flexible templates for object-relational layer between MySQL tables and Zope objects, the layer engine based on Zope SQL Methods; set of markup Zope Page Templates for the presentation format for export/import objects; template of Pascal language program for data export from previous version of IS; C-language efficient data importer from XML-representation; templates of input fields for user interface. For Zope objects we have also generated methods reflecting class-to-class relations, e.g., methods to get all tumor cases for a patient. The transformation engine has also generated the metadata, which used by Zope methods for special utility purposes. Our instrumental software has generated 91 tables for database and more than 8000 lines of source code. The kernel of the transformation engine and most of the rules was implemented in the context of the project for 3 human-months. The transformation cycles took about 1 minute.

The generated source code, methods and modules were integrated into IS with calling the code or inheriting

it, so we could regenerate the framework without loss of later made changes of source code. Database data integrity supported manually and was periodically reimported from the database of the previous version. User interface was constructed manually from widgets, supplied by object's methods.

Using the MDA in this project we faced a number of problems. To the end of the design stage PIM occupied 4 m² and could be displayed only partially on the screen, some time was spent for periodical layout adjustment (location and color) of the model classes by their properties. Memory integrated YAP (Prolog) and Python transformation engine started to crash on big-size input PIM, we switched to less productive process- and stream-integrated version of the engine. Practitioner programmers did not share our optimism about MDA usage: they preferred verbal form of modeling; they were forced to implement report generation subsystem. Some years later Genteware decided to charge for new and all old versions of Poseidon for UML CE, but none of investigated free UML editors can load our model now.

At the end of the design stage we had almost functional IS supporting most of required function but it have somewhat ugly interface: medical stuff was too busy to help us with testing and refining. Presently the PIM is used on-site programmers as source information for recreation of production grade version on Django/PostgreSQL platform. Now the IS is used in the oncology hospital.

IV. CURRENT DEVELOPMENT OF THE TECHNIQUE

Further development of the technique is aimed at raising performance and expressive abilities of the transformation system, as well as its reliability. Main problem is that it is hard to provide efficient and in the same time sound integration of Prolog and Python: both systems have its memory management units but different memory management strategies. We decided to shift the system to use powerful expressive abilities of LogTalk Prolog [7] macro package supplying it with an imperative subsystem and a template engine. LogTalk is an object-oriented logic programming language that can use most Prolog implementations as a back-end compiler and inference engine. As a multi-paradigm object-oriented language, it includes support for prototype and class inheritance, protocols/interfaces descriptions, component-based programming through category-based composition, event-driven programming, and high-level multi-threading programming.

In the new implementation [8] of the transformation we take advantage of the same object-oriented hierarchical modular architecture as before, but set up another goal - to support transformation in both directions: from abstract PIM to source code and from the source code to abstract models. This should partially allow developers to

- modify generated source code and conserve changes, i.e., account them in PSM and PIM;
- develop software on the various levels of abstraction;

- accumulate libraries of complexes of models and their implementations as well as transformation modules.

The results of the investigation will be realized in a software development environment, integrating UML design software and source code IDEs. The integration engine is to be based on change propagation [9]: the modifications made are recognized by the environment and pushed to other utilities.

A. LogTalk transformation module example

Let's consider a code example written in the LogTalk programming language. We have the following interface class for access to the loaded XMI DOM2 tree. This class is used in Model class, that is a primarily recognize the model in XMI file.

```
:- object(class, instantiates(class)).
   :- private(attributes_list/1,
              operations_list/1,
              . . . . .
              parse_operations/2).
   :- public(new/5,
            new/2,
            name/1,
            operations/1,
            attributes/1).
. . . . .
:- end_object
```

Next code is an example of a transformation procedure

```
:- object(TransformToSQL(Class, Type) )
. . . . .
%Parametric object allows to customize some parameters
database(Database) :-
    parameter(1, Database).
class(Class) :-
    parameter(2, Class).
databasetype(DatabaseType) :-
    parameter(3, DatabaseType).

gen_sql(Name, Attributes, Output) :-
    append("CREATE TABLE", class::Name,
          Output),
    append(Output, ::gen_attributes(
          class::attributes,
          Attributes), Output),
    append(Output, ::databasetype, Output).
. . . . .
:-end_object
```

Call to the *gen_sql* method looks like *TransformToSQL(Student, "Inno DB")*.

B. Change Propagation

Definition of change propagation in [9] from the MDA pint of view can be interpreted as a way of transformation. Transformation engine compares two versions of PIMs, recognizes the difference and corrects PSM and source code in the corresponding points of change. The transformation approach uses specially stored links between objects from PIM and corresponding generated object in PSM. When an object changes or deleted its image in PSM traced by its link.

We suggest extending this idea to allow the propagation in both directions, including from PSM to PIM. This should results in the following additional advantages:

- Record the stages of the development as complexes of abstract models and corresponding source code fragments;
- Allow designers to transfer the model complexes between projects.

To deal with stated extension and planned features we proposed to apply the theory of systems of complexes (configurations), successfully used in geography research [10], to software life cycle, implying that the software development is a natural process. The theory shows how to represent model elements, relations between elements, transformations and links as complexes, as an element of a category. In [10] we shown that as the model complex and a change are elements of the same set of complexes, hence the change is expressed with the same language structures as the model complex. Similar arguments are true for transformation modules; they can transform both the model and its change.

Some practical examples have been found, like *diffutils* package of any Unix distribution, which demonstrate the investigation results. The package allows programmer figuring out the differences between two versions of a source code text file (*patch file*) and apply the *patch file* to the sources. The package contains two main utilities *diff* and *patch*. The first utility compares two ASCII or Unicode texts and produces a new text file with a representation of the difference between input files.

```

--- t1.cpp 2012-02-12 11:50:42.668030039 +0900
+++ t2.cpp 2012-02-12 11:52:44.944957992 +0900
@@ -2,6 +2,7 @@
     char * name;
 };

-class Pupil:Person {
-   Class * cls;
+class Student:Person {
+   char * stud_no;
+   Group * group;
}

```

In this example shows that the difference is shown with the same ASCII or Unicode characters: the text is shifted by one character right so the first column became control column, where characters define a modification. The space character denotes a context of the text part under change. The minus character denotes part that to be removed, and plus character denotes the new text composition to be added into the context. As in one patch file the whole project change set can be stored, special format substrings “---” and “+++” are used to denote the particular files, and “@@” is used to denote general relative position of the first line of the context in the files.

Links from PIM to PSM express context of changes more precisely than patch file format, and allow back transformation engine to recognize the differences. We suggest using an intermediate text format between PSM and generated source code. This format reflects the links and also account that the generated source code in a general case is not a flat text anymore. The format can be constructed on the base of a D.Knuth's Literate programming [11] implementation. Literate program itself is a tagged tree representation of computer program, and those tags can be generated from PIM and PSM and

reflect the links and abstract objects of the model. In opposite direction the changes of the source code now can be more precisely recognized having the tags at hand. There are well developed tangling and untangling algorithms (reverse direction), e.g. in [12].

V. CONCLUSION

We have considered an existing implementation of transformation engine for Model Driven Architecture approach to software development in the case of information systems. The approach is based on mixing high level object-oriented programming language Python and logic language Prolog. The transformation is represented as network of modules. Each module carries on a subtransformation and implemented in a pattern-directed fashion. An example of application in medicine and further development of the system is considered.

One of the aims of the research is to construct a software development tools based on analogy. For example, having stores in a revision control systems all the states, models and stages of MDA software development as change complexes, it probably be possible to construct new sequence of differences for new original model.

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IT Service Management as a Crucial Factor for the Success of SMEs in Europe

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Abstract - The development of contemporary IT has a significant effect on small and medium enterprises (SMEs). Considering the increasing importance of IT services, it is necessary to devote attention to ITSM (Information Tehnology Service Management). IT Service Management is the planned and controlled utilization of IT assets, people and processes to support the operational needs of the business as efficiently as possible and to ensure quickly and effectively reaction to unplanned events, changing circumstances and new business requirements. Managing the complexity of today's IT and business at the same time is very hard work - especially for small and medium-sized enterprises (SMEs). IT Service Management is very important factor for successful SMEs often do not know how this contributes to their business. Therefore, SMEs should get familiar with IT Service Management. The project INNOTRAIN IT is of a great importance for SMEs. The general objective of the project INNOTRAIN IT is to facilitate innovation in the participating regions and remove barriers for the diffusion of innovation in regional SMEs. The project will improve public knowledge of the Information Technology Service Management (ITSM) in Central Europe. The paper points out the main advantages and disadvantages of using ITSM in SMEs.

I. INTRODUCTION

Today it is impossible to imagine an enterprise operating without the latest information and communication technologies. The development of IT (Information Technology) has had a great impact on the business market of the modern world. With the appearance of more powerful hardware, software and ultra fast networks, small and medium enterprises (SMEs) in Europe have been able to develop their products and services based on IT. These events marked the transition from the industrial age to the age of information. In the information age, everything becomes interconnected and everything functions faster and in a more dynamic way. In today's modern world the significance of using computer technologies and the Internet in order to improve the management of companies is emphasized. There is broad consensus that SMEs are key to future job creation. Information Technology Service Management (ITSM) will be an essential driver of future innovations if European knowledge-based economy.

II. IT SERVICE MANAGEMENT AND ITS IMPORTANCE FOR SMEs

A. Information Technology in SMEs

Traditionally, IT has meant delivering products: hardware, software, computers, etc. Today IT is typically considered a service domain, even though it uses products for providing IT services. Because of this it is necessary to point out some of the differences between IT products and IT services. In order to better understand these differences, we shall point out some of the basic characteristics of services: services are intangible, are produced and consumed at the same time, they are variable (changeable), the users often influence the quality of the service, the satisfaction with the service is subjective. „Service“ is the basic entity of ITSM. An IT service is a service provided for one or more users by an IT provider. An IT service is based on the use of information technology and provides support for the user's business processes. ITSM is a service-focused approach which was originally known as information technology management (IT management).

The basic goal of the ITSM process is to better the quality of IT services. ITSM is related to the management of the quality of IT services which satisfy the needs of businesses. [1] ITSM is related to the management of providing IT services which satisfy the expectations of users. The goal is to constantly improve the quality of services provided, in order to provide effective and efficient management, in coordination with the demands of business. ITSM is becoming more important in the modern world, since there is more reliance on IT when starting a new business. [2] Many companies rely on IT today. This means that the majority of business processes and the very existence of the firm depend on the normal functioning of different IT services. In other words, the focus of most business activities is on services and service management. The successful deliverance of services is a result of good organizational skills and the synergy of the

following elements: people, processes, technology, organization and integration. [3]

Information Technology (IT) is the most important driver of innovation and competitiveness of small and medium enterprises. The use of modern technology is a revolution in the way business is done. Unfortunately, the potential of IT-enabled innovation and new business models is still underexploited by small and medium-sized enterprises (SMEs) in Europe. SMEs are a major source of entrepreneurial skills and creativity and contribute to economic and social cohesion. They hold the key to innovation and are also emerging as global players, by participating in worldwide production and supply chains. [4]

Information and communication technology (ICT) plays a key role in promoting innovation and competitiveness of small and medium-sized enterprises and the IT sector. However, the problem is the training of the labour force in the use of modern ICT. The future of European high-tech industries will depend to a large extent on small and medium-sized enterprises (SMEs), which account for around 95% of companies. Information technology can help reduce costs, enable more efficient development processes and bring products to market more quickly than in the past. [5] The current business world is undergoing consistent change. The ability to react quickly to changes is becoming a competitive advantage for small and medium-sized (SMEs) enterprises compared to those that are unable to be as flexible as other SMEs or larger companies.

SMEs demonstrate their ability to work with large companies with which they create new partnerships and strategic alliances. These adaptable companies working in a global environment with the consistent threat of new competition and changing markets, legislation and suppliers, show it is necessary to possess data, information, knowledge and value the experience of their employees. The need for new knowledge and skills requires that employees improve their skills and knowledge continually; by increasing their intellectual capital employees contribute to a consistent improvement in services and product innovation. The transformation of intellectual capital into new products and services, however, requires a new approach to management of the organisation, a flexible organisational structure and the use of information and communication technologies. [6]

Globalization has a great influence on the way modern companies work. Since a greater number of SMEs are becoming globally connected, it is necessary to redefine the basic framework of overall management. IT has become one of the most important resources of modern companies which aids their continuous transformation, in order for them to achieve a competitive market advantage. [7] The role of IT has changed drastically over the past years and organizations can expect even more significant changes in the next couple of years. This is because business expectations have changed, and business leaders emphasize that IT will provide the technological solutions which support top business goals such as: the improvement of business processes, cost reductions for companies, a greater usage of information, improvement

of labor efficiency, attracting new and keeping old clients, creating innovative products and services. [8]

B. Information Technology Service Management

In time, the function of IT management has changed. At the very beginning of IT application, IT management had to provide the necessary IT resources and control the technical harmonization and functionality. In time, IT influenced all segments of business. Today the basic role of IT is the role of service provider, which has led to the development of IT Service Management or ITSM, with IT Infrastructure Management as its key component. The focus of ITSM is on the identification of services which clients find necessary, the planning and delivering of these services, providing availability, performance and security requests. It should be emphasized that IT services have become the center of IT Management and that the basic goal of ITSM is to fulfill the needs of users by providing adequate services. ITSM codifies and supports the best current practices in managing the existing IT infrastructures. [9] In the future most organizations will adopt ITSM, having in mind the number of advantages of ITSM. These advantages mainly refer to the fact that IT services are coordinated with the needs of users, while the costs of providing IT services are significantly lowered.

Information Technology Service Management (ITSM) is a discipline for managing IT systems, centered on the customer's perspective of IT's contribution to the business. Thus, by strengthening the performance of SME's IT departments, ITSM enables process innovation and product innovations can be promoted. However, many SMEs have not used this feature to its full potential because of a lack of knowledge about existing solutions, or a lack of trained and informed staff or lack of transparent and neutral information about ITSM platform.

Organizations depend more and more on IT in order to fulfill their corporate goals. This growing dependence has led to a growth in the need for IT services which corresponds in quality to the goals of business and which fulfill the demands and expectations of customers. The effectiveness and efficiency of ITSM systems, processes and strategies are of key importance for the success of IT. ITSM is the management of all processes which provide quality IT services, in accordance with the needs of users. [10]

C. The importance of ITSM for SMEs

Small and Medium Enterprises (SMEs) are enterprises which have less than 250 employees, their annual turnover doesn't exceed 50 million euro, and / or their annual balance sheet total is not more than 43 million euro. More than 20 million enterprises run their businesses in the EU. Only 43,000 enterprises of all are large enterprises. Therefore, large companies make 0.2%, medium-enterprises 1.1%, small enterprises - 6.8% and micro-enterprises 91.9% of all enterprises. Overall, 99.8% of all

enterprises are SMEs. SMEs that use ITSM are more efficient up to 20%. SMEs that use ITSM are more innovative on the level of business processes than others (5 times more innovative). SMEs that use ITSM are up to 250% more innovative on the level of products than others. [11] SMEs created 76 % of all new jobs in Europe in the past 3 years. As is also well known, SMEs generate, on an average, more than 70 % of business turnover in Europe. [12]

For many SMEs owners the business represents their lifestyle fulfilling their personal dreams and visions, The research suggests the approach of the owner, age, personality, experience, managerial skills, education, enthusiasm, etc. are important for the growth of SMEs. The owner's approach may be also influenced by mutual relations with other family members who participate in the ownership or running of the organisation. Sometimes quite complicated family relations can be observed to have negative impacts on the running of the business.

Based on the long term survey of IT use in European countries the economic and social benefits of being a small or medium-sized enterprise are:

- Ability to create conditions for development and implementation of new technologies.
- Ability to mitigate the negative impact of structural changes.
- Ability to work as sub-contractors of large companies.
- Ability to operate in marginal areas of the market that are not attractive for bigger companies.
- Ability to create work opportunities under low capital investment.
- Ability to quickly adapt to requirements and fluctuation of the market,
- Ability to decentralize business activities.
- Ability to support fast development of regions, small towns and communities,

Potential growth and survival of SMEs is largely dependent on the environment surrounding the companies. Small and middle-sized enterprises are negatively affected by the following factors:

- Low economic power compared to large companies.
- Difficultly gaining access to capital with a consequently limited ability to finance development activities.
- Worse access to specialized training and education compared to larger companies.
- Lower access to necessary information and consultancy services.
- Unfair competition from large companies and dumping prices of imported products,

- Limited sale of finished products on the domestic market and increased cost of export.
- Competition of retail organisations managed by financially strong companies.
- Weak position in public tenders.
- Failure to and delay in receiving payments resulting in secondary financial insolvency,
- High administrative demands from government bodies and agencies. [13]:

The importance of ITSM for SMEs can be realized by highlighting the difference between large enterprises and SMEs. SMEs have a number of advantages over larger companies. First, SMEs are smaller and much more prompt in decision-making. Unlike large companies that are burdened by bureaucracy, SMEs are able to quickly take advantage of market opportunities or to create a new product / service. Second, SMEs, unlike large, do not have to struggle with outdated products or services, but may introduce new products and services faster and can adapt new ways of doing business. Specifically, SMEs are more flexible. Third, SMEs can realize many benefits of using IT and ITSM to reorganize and redesign their business. SMEs are disadvantaged in three main areas: financial constraints, lack of knowledge and IT-related skills, lack of managerial vision and strategic leadership. Goals of using the ITSM in SMEs are:

- successfull use of ITSM,
- improve innovation and competitiveness,
- elimination of barriers for using ITSM

SMEs have problems in adopting ITSM because of very high fixed costs related to technology. These costs include costs such as creation website, using e-commerce and costs associated with projects of electronic auctions, search engines and similar cases. Small and medium enterprises have limitations such as low investment, lack of laboratories etc. SMEs don't have required expertise and knowledge for using ITSM. For many SMEs, opportunities and benefits of ITSM adoption are still unproven. This problem causes that they are reluctance to complete the adoption of new business models and technology. Financial constraints are the most important limitations for adopting ITSM, but there are other factors such as less time, fewer resources etc.

D. Innovation training IT Central Europe

The focus of INNOTRAIN IT project (Innovation training IT) is to transfer knowledge on ITSM, empowering SMEs to strengthen the innovation potential of their businesses in Central Europe. The project consortium consists of twelve partners from six countries: Germany, Poland, Czech Republic, Slovakia, Austria and Hungary. By combining professional expertise of researchers with experiences in business processes the consortium will establish at least 800 innovation processes within companies in Central Europe and foster the transnational exchange of knowledge, tools and

methods about ITSM. INNOTRAIN IT is co-funded by the European Regional Development Fund with 1.5 million Euro. The project runs from April 2010 until March 2013.

The overall objective of the project is related to the adoption of IT innovation in the region and the removal of barriers to the adoption of innovation in SMEs. In the first phase, an online research about the use of ITSM in small and medium-sized enterprises was carried out. The survey was conducted in all regions participating in the project: Austria, Czech Republic, Germany, Hungary, Poland and Slovakia.

The planned activities of the project INNOTRAIN IT will be oriented at the implementation of ITSM that should as a result make more resources in SMEs available as well as enable the implementation and development of process and product innovation. Within the project lifetime the partners will exchange methods, best practices and tools to design and operate ITS successfully. In this manner, by transferring know-how, experience and setting up a common training platform, synergies are fostered and a comprehensive approach to ITSM support is realised. The general objective of the project INNOTRAIN IT is to facilitate innovation in the participating regions and remove barriers for the diffusion of innovation in regional SMEs. In general, the project will improve public knowledge of the Information Technology Service Management (ITSM) in Central Europe.

The online survey showed the differences in ITSM usage and adoption in SMEs in the six Central European regions. The use of ITSM enables small and medium-sized businesses to save around 30% of their resources by reducing IT costs. SMEs can invest these resources in enterprise development and adoption of innovations. It should be noted that there is a large gap between the theory that the SMEs have about ITSM and practices that are rarely implemented. Nearly 40% of small and medium enterprises have the knowledge about ITSM frameworks and methods, but only 10% apply ITSM in practice. Barriers to greater use of the ITSM in SMEs is the complexity of existing ITSM. It is also necessary to point out the lack of training and education of employees in SMEs for adopting and implementing ITSM.

The project focuses on the promotion of innovative methods of IT in SMEs, to raise awareness among SMEs on regional innovative products and services and options to facilitate cooperation with suppliers and customers. The aim of the project is to encourage cooperation and exchange of knowledge in CE. The project will provide an analysis of ITS enabled innovation, will develop innovation and training methods as well as provide a web-based transnational training platform. The project will make available an innovation maturity report describing the maturity level of 6 participating regions in ITS enabled innovation, various case studies and training modules. The project will result in establishment of around thousand learning processes and trained SME responsible, as well as deliver around 800 change and

innovation processes in SMEs based on extended ITS enabled innovation maturity. [14]

E. The benefits of using ITSM for SMEs

Information technologies are regarded as key drivers of innovation in SMEs. However, many SMEs, particularly in the production sector, still have difficulties in utilizing these new technologies efficiently in order to foster process and product innovation. This is partly due to the fact that many SMEs don't use IT Service Management and waste many (financial and personal) resources in running basic IT-functions.

The advantages of using ITSM in SMEs are:

- service quality,
- enhancement of business,
- risk reduction,
- business competition,
- cost reduction,
- new work opportunities,
- quickly adaption to requirements and fluctuation of the market,
- new product development,
- introduction of standards.

On the other hand, there are some problems that should be mentioned:

- lack of skills,
- lack of resources,
- ITSM awareness missing,
- complexity of existing frameworks,
- work overload. [15]

SMEs learn how to simplify their IT by using the innovative potential of ITSM by offering:

- a newly developed, simplified ITSM method tailored to the needs of small and medium-sized enterprises,
- free of charge face-to-face trainings qualifying at least 1,000 CEOs and CIOs across Europe and
- an interactive online training platform. [16]

III. CONCLUSION

With the development of modern information technology, small and medium enterprises depend more and more on IT in order to fulfill their goals. This growing dependence has led to a growing need for IT services which correspond in quality to the goals of business and which fulfill the demands and expectations

of buyers. The effectiveness and efficiency of the ITSM system, processes and strategies are of key importance to the success of IT. It is necessary to emphasize the importance of the ITSM for SMEs. The project INNOTRAIN IT is very important for SMEs. This project will improve public knowledge about the ITSM in SMEs in Europe. Today a large number of SMEs rely on IT in their business to fulfill the expectations of users in regard to the quality of their IT services. Adopting a good practice can help the provider of services create an effective system of service management. The use of ITSM enables small and medium-sized businesses to reduce IT costs. SMEs that use ITSM are more efficient and more innovative than other enterprises.

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E-banking- Modern Way of Banking

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Abstract - In recent years, the banking industry has experienced some significant changes from qualitative and quantitative aspect. Namely, in the race for more profits, banks introduce new products, also known as financial innovations, in order to defeat the ruthless race with the competition; they seek ways for consolidation, mostly through mergers or acquisitions by domestic or foreign banks. The most significant financial innovation, which is a direct product of Information Technology, is the electronic banking, or e-banking. The purpose of this paper is to explore the needs, characteristics and functioning of electronic banking, and research the latest developments in this area, which are related to purchasing and selling goods directly from home. Introduction of E-banking is a necessary phenomenon for the sake of efficiency, cost-effectiveness and availability of the system, as well as for the need to expand banking services and products. However, the system has some weaknesses that need to be addressed, and which have a primarily security and application character. In the end of this paper will analyze the electronic banking in Macedonia, through the mechanisms of the Stopancka Banka AD Skopje.

I. THE NEED FOR INOVATION AND INTRODUCTION OF THE E-BANKING

The banks, in order to maximize their yields and to survive in the modern conditions, are constantly forced to introduce new products and techniques. It is known that they (commercial banks), as basic financial intermediaries exist for profit, earning from the difference in the interest rates and from certain fees.

However, the processes of deregulation and globalization exacerbate the situation and competition between the financial intermediaries, because foreign banks are penetrating the domestic market, which leads to creation of large banks (large these, fours), the banks are reducing its interest margins (in order to offer competitive products), are implementing information technology, and in the race for new products, they are forced to use some new innovations and new methods, as well. As a result of the massive use of information technology (from banks and customers), a new, modern system, new financial innovation in the banking industry, known as the e-banking is created, but for the banks and the financial sector there were some other innovations, as well.

The process of creation of the financial innovations itself is known as financial engineering.[1] Financial engineers uses a set of mathematical formulas and operations in order to create new investment strategies in

order to solve the existing problems, but also to realize some new profit opportunities.

The most important financial innovations targeting the banking sector are [2]:

- financial derivatives,
- securitization of loans,
- selling loans to raise funds,
- guarantees standby (stand by)
- credit derivatives
- electronic banking (e-banking)

The electronic banking (e-banking), is modern technique of executing banking activities, i.e. mode of delivery of the banking products. The e-banking as a process occurs as a result of the technological revolution in the last few years, which can be perceived through the computerization, the mass use of the internet, and development of information systems, on the one hand, as well as a result of the need to serve more customers in a certain period, reducing their hassles and waiting.

II. THE BASIC FEATURES OF THE E-BANKING

The prime feature of e-banking is introduction and implementing the electronic transfer of funds, with completely reject the basic traditional asset of payment – paper, and using the electronic money. As a result of removing physical contacts between banks and clients, they are also known as virtual banks. Primary currency of this system is the electronic money that are virtual money that have the following features [3]:

- The initial owner of the electronic money must pay in advance (PRE-PAID system), the value through the use of traditional means of payment, and that amount should (through informational channels) to be written at the chip of the plastic card,

-The electronic value must be accepted by the other parties in order to perform electronic transactions.

Electronic money is found only in the electronic form and represents a particular electronic record or impulse. Electronic banking, has reached its apex, basically as a result of the development of the information technology. Nowadays, every bank, every institution uses computers, mobile phones and internet networks, so the introduction of e-banking becomes imminent event and basic transfer system in the financial sector. In such a new conditions, the customers can check their accounts at any time, even via mobile phone or laptop, or can easily buy certain

goods over the internet anywhere and anytime.

The most significant effects from the introduction of the information technology in banks are [2]:

-strong competitive technology that leads to increased overall competition between banks and the other financial institutions, because it supports the processes of deregulation and globalization.

-electronic technology leads to emerging the economies of scale and economies of scope, that increases the productivity growth of banks' operations, in the same time reducing the cost of data while processing and offering cheaper services to their customers.

-the information technology leads to significant organizational changes in the banks, encouraging the processes of mergers and acquisitions. As a result of this technology, the banks in order to survive in the new market conditions, have to increase the synergistic effects, restructuring themselves, and merging with other banks,

- the credit rating of the banks, that have accepted and are using the information technology is significantly higher than the rating of traditional banks, because of the modern systems of credit monitoring and selection, and continuous 24-hour supervision of the customer, reducing the wrong selection and moral hazard.

E-Banking is quite positively accepted by the bank clients, as well. The attraction of the electronic banking is the result due several factors [4]:

-provides access to banking services from any place (or home computer, or from the ATM or POS terminals)

-provides access 24 hours a day (non stop)

-cost-entities do not waste time going to the bank,

-transactions are executed very quickly and easily,

-users have privacy

-no unnecessary hassles and waiting.

All these possibilities should be analyzed through the prism of cost or efficiency and quality. The banks tend to have multiple terminals, in order to serve more customers in a given period of time, and through the growth of the economy of scale to minimize the costs on one hand, but also to increase the trade and the number of consumers, in the cruel race with the competition for penetrating the market, on the other..

The quality of the services in e-banking system can be analyzed through the following factors [3]:

-the speed of performing the banks transactions, often through the use of so-called payment cards. One of the primary reasons for the implementing this system is exactly this factor, i.e., the need for speeding up the transaction, reducing the waiting before counters, as well as contacting the bank from home or office while saving time and money.

-reliability and durability of bank transactions, which represents the key prerequisite for the functioning of this system, creating customer confidence towards this system, which would occur automatically and to increase the total

amount of transactions and profits of the banks. It is common that one of the primary factors for the occurrence of the banking and financial crises is precisely the loss of confidence of investors and depositors, and the lack of reliability.

-the economy in the execution of transactions, is certainly the most important factor for the banks, which forms the cost of bank products, with which, the banks, directly influence on the end users, who are always willing to pay cheaper. For the system to be more economical, it is necessary in the first place, to have large number of users, encouraging economies of scale and scope. Certainly, in current economic conditions, almost all payments are carried out electronically, which justifies the usage of this system, whereby banks are further perfecting and putting the electronic banking on higher scales, introducing additional new products and channels and focusing mostly on the home banking.

III. E-BANKING FUNCTIONING SYSTEM

The electronic banking is a specific system that is composed of institutions (mostly banks and system operators, network engineers and computer specialists), a network of computers, connection to the intranet and the Internet, a wide range of products with low competitive prices. E-Banking means usage of the banking services directly from the home, which saves time and money, or by going to the so-called cash terminals. In such a process, the bank client uses a phone, computer, TV or terminal to make contact with the bank, without the need for filling out forms, waiting in lines and more.

The e-banking system consisted of:

-electronic money,

-payment terminals and

-plastic cards

A. ELECTRONIC MONEY

The basic feature of the e-banking system is the electronic money, also known as electronic currency, e-money, digital money, or digital currency. The electronic money is money that is transferred and exchanged electronically. In technical terms, electronic money is an online representation, or a system of debits and credits, used to exchange value within another system, or within itself as a alone system [5]. In principle this process could also be done offline. This "new kind" of currency doesn't have material form, like the common currency, so all the transactions are executed electronically, via computers, payment terminals, plastic cards, internet, or intranet. The electronic money represents special kind of electronic records, stored in computer, network, or plastic card chip. In the process of payment and clearing, the money is transferred from one to another account, electronically. To use this kind of money, at first, it is necessary, to convert the banknotes to electronic money, usually at the customer's bank, and then the money can be used for electronic purposes, and on-line payments. In the future, the banknotes tend to disappear completely, where the electronic money will replace them.

B. PAYMENT TERMINALS

Payment terminals are actually representatives, or small bank branches, that are working all the time, are always available to customers and are usually located close to clients, i.e. in densely-populated areas. Generally, there are two types of payment terminals:

-ATM (*automated teller machines*)

-POS (*point of sale*)

1. ATM terminals are banking machines, known simply as ATM, which perform routine operations for end users and are known as "electronic branch". They contain microprocessors that have on-line connection with the bank's database and where customers can withdraw money at any time, without going straight to the bank. Usually ATM are installed at the high-frequency (near city molls, near downtown) places and they operate 24 hours a day. The first ATM terminal appeared in the U.S. in 1968. [4]

The basic ATM terminals are so called, cash dispensers [3], that are only issuing cash, based on plastic card status, however modern ATM terminals perform and other functions, as well, such as: checking account balance, transfer money between two accounts, raising money from transaction and savings accounts and etc. The new, contemporary forms of ATM terminals have an interaction with the officers directly to the bank, so that they can answer any questions to their customers on-line, solving their problem, issuing cash, and other activities.

2. POS terminals are used for electronic purchasing of goods and services directly from the store. So by using this terminal, the buyer, through its debit or credit card, can make his payment directly into the store through the POS terminal (owned by the seller). In the process of payment, the buyer need to insert its card into the terminal, and to entered his password, while the seller have to enter the amount of the sold goods, in order to perform the transaction. The terminal is directly linked to the seller's bank, so the funds are transferred in real time from the buyer to the seller and the sale and the clearing concludes in the same time. If the customer uses credit card, the POS terminal checks whether the customer has sufficient funds within the credit limit or not, informing the seller and rejecting the transfer if necessary.

C. PLASTIC CARDS

The basic products, which are used in this system, are known as payment or electronic cards, which are sold to end users, i.e. the natural and legal persons with ambitions to deposit money in the bank, to perform certain electronic payments, or to take credit. The main advantage of these cards is that, they can be used at any time, either online or through ATM terminals, avoiding unnecessary crowds or waiting in the banks counters, while saving time and money at the same time.

In the Republic of Macedonia the number of plastic cards has increased multiple times in the recent years, so in December 2010, an estimated 1.4 million were using the credit cards, from which, about 1.05 million were

debit card owners, and approximately 303 000 were credit card owners.[4]

The main factor and requirement that needs to be maintained in the electronic commerce payment cards is the safety and reliability, which means that the cards can easily be lost or stolen, so additional measures are needed to be taken in order to protect the customers, regarding this factor, payment cards must have double protection, i.e. they must have a built-in chip, which is typical for this card, on the one hand, and password request, on the other hand. Thus, in case if the card is being stolen, however, it can not be used, and manipulated (due to ignorance of the password). Remarkable credit cards are: Visa, Maestro, MasterCard, American Express, Diners Club

The payment cards can be classified into the following categories [3]:

-*standard plastic cards,*

-*payment card,*

-*debit cards,*

-*credit cards,*

-*cards for electronic payment,*

-*intelligent cards (smart cards).*

A. Standard plastic cards are the first and basic form of electronic cards that have a magnetic stripe, PIN code, and username, and also have a using limit. Such cards, are commonly used to raise small amounts of money and for working with card files. Lately, the intelligent cards are more commonly used, unlike the plastic cards.

B. The Debit cards are used for the purpose of constantly withdrawing money, by the client, from the banking account, for his current needs. The cards can be used at the ATM or POS terminals, at any time, if the client has a cash transaction account. These cards can be also used for buying in stores, that is performed immediately by transferring the funds from the buyer's to the seller's transaction account in real time.

C. The payment cards are special electronic cards that are used exclusively for the purpose of payment of the user's obligations, usually for purchasing, but also for other services (parking, phone calls ...), as well.

D. The credit cards are actually credit lines, granted by the banks, or basic consumer loans, that the user can withdraw money or can purchase goods, but unlike the debit, these cards can have negative balance, as well, so the user could spend more money, than there is, with obligation, by the end of the month, to return that amount, paying plus interest, as well. So in this period of time, the user of the credit cars is actually, credited by the bank. Also, the card holder is obliged to make an annually payments of interest for using the credit card.

E. The cards for electronic payment are the latest type of plastic cards that are used for on-line purchasing products, directly from their home or work. This type of cards do not require using ATM and POS terminals, but the customer, should deposit a certain amount of money (PRE-PAID system) that can be used in the future for the

on-line transactions and purchases, straight from his computer, at home or work.

F. The intelligent cards are electronic cards, which have a built-in microprocessor chip, which gives memory and ability to calculate for the e-card. The credit cards and debit cards are actually forms of intelligent cards, and they have massive use in the system of the electronic banking. Public transport tickets and phone cards are forms of intelligent cards.

IV. HOME BANKING – THE LATEST TREND IN E – BANKING

E-Banking, as a system is constantly in development, so in this current conditions, a financial transaction practically it can not be imagined without, avoiding the channels of this system. Today, all the subjects are using the plastic cards on daily basis. However in recent times, a new trend in electronic banking is emerging, known as Home banking. This system involves using the banking services, straight from home, using the internet, telephone or intranet, generally, this system implies using the bank service, straight from the customer's home, at any time.

The home banking system is consisted of the following methods:

- telephone banking,*
- based-on-line banking via intranet*
- based-on-line banking via Internet.*

The telephone banking is the basic form of home banking, where the customers, via phone, are connecting to the bank clerk, and finalizing the desired bank operation, or payment. This kind of banking originates from France, where today is most used e-banking system. In France and the UK, an estimated 10% of all the customers [6] are using telephone banking services.

The On-line Banking based on intranet is used by a large number of banks, where direct contact between the customer and the bank through the intranet, or through internal network exists, designed specifically for satisfying the customer by the bank. Thus, based on this network, via computer, the user can contact the bank, at any time, and make the required payments and obligations. To perform this type of communication, there is no need for phone calls, and it is more efficient, more accessible (24 hours) and more useful, unlike the telephone banking, as a banking system.

The On-line Internet-based banking is the most used method within the home banking, and it is quite similar to the previous method, but with the difference that in this case, the internal network, isn't used but Internet protocol, known as the www (world wide web) network. Thus, this method is the most accessible, most efficient and most used method, due to coverage of the international network and no additional costs for installing the internal network system.

V. E-BANKING IN MACEDONIA -THE CASE OF " THE BIG THREE "

The banks and companies in the Republic of

Macedonia are widely using internet for their business facilitating access to information, communication, and payment. In January 2012, an estimated 87,3% from all commercial subjects (that have ten or more workers), used internet, for comparison. In 2011, an estimated 84% from the subjects were using internet [7]. In recent years in the Republic of Macedonia, the electronic banking was widely and significantly used, because all the banks have successfully implemented the system., offer their products online. Of course, the most successful banks that have implemented and used this system were the banks from "the big Three", although the smaller banks (Sparkasse bank, UNI bank...), are using the system, as well. During 2011, 8.9% of enterprises with 10 employees or more, had used e-banking and e-commerce, ie buying or selling goods or services via computer networks, of which, internet sales realized an estimated 5.3% and internet shopping performed 4.8% of all the enterprises [7]. Stopanska Banka AD Skopje, as a member of "the big Three (Largest banks in the Republic of Macedonia are : Stopanska Banka AD Skopje, Commercial Banka and Tutunska Banka) " is actively using this system, and officially states that: *The e-banking service commercial bank allows You either from home, office or anyplace with Internet access, to perform financial transactions or to inspect the situations and reports of Your bills and Your credit and deposit products of the Bank.* [8]

Regarding the reliability of the system (such a problem number 1), Stopanska Banka AD Skopje, has the following notes [8]:

-E-Bank service is secured from unauthorized access to a maximum extent, by applying contemporary methods of encoding and digital certificate.

-For access to the e-Bank service, every user will receive a username and password, which must be changed at the first logging in.

-For using the e-Bank services, it is sufficient for the user to have a username and password.

-Only for the payments service, the user must receive a digital SB certificate for signing the transactions. -The medium on which the certificate is issued in a CD for individual, and USB-token or Smart card for legal entity.

-All exchanged data are encrypted and they are available only for those to whom they refer.

Using of this system, for the end users is acquiring [8]:

-monitoring real-time status of accounts,

-monitoring of transactions accounts,

-download excerpts of accounts,

-payments on the basis of Treasury bill (HB-50), employee salaries (PP-53), foreign currency account (I450),

-payments with pre-designed templates to facilitate the processes and others.

The bank's website further explains the terms and conditions, in order to become a user of the system, and

all the features and applications that can be used in the system, with possibility of concluding On-line agreement for using this banking system.

Commercial bank AD Skopje, is also using the e-banking system, from 2001 year, for business, and private subjects. Its system pays special attention to internet security, as a number one priority, and therefore, it had been conducted ethical hacking tests by domestic and foreign companies specialized in the field of information security, there is no evidence of vulnerabilities that could seriously compromise the security of the e-banking system, as in the selection and application of technologies and established processes and activities of persons responsible for its development and maintenance. Focusing on the system security, as number one priority, is particularly significant for emerging and developing countries, like Macedonia, where the capital is concentrated in several subjects, where poverty exists, and the unemployment rate is 30 %, where are scandals about stealing data via internet, and where the subjects are pretty much sceptic about the financial innovations.

Commercial bank, highlight several segments about internet security, that could be paid attention, and should be implemented in other banks [9]:

-Subjects should never give their personal information or financial information to unknown persons,

-According to the Bank's information security policy, the bank's officer, should never ask the user to reveal the following digital identification marks in order to access bank services on the Internet (user password, PIN number, and the list of codes for single use

-The users should pay special attention to phishing, because some other subjects tend to discover the sensitive data. (Phishing is well thought scam whose goal is collecting sensitive information, mostly digital identification marks as usernames and passwords, where the trickster masks like a trusted entity in an electronic communication with which the user is accustomed to work (for example he masks like the commercial bank internet bank).)

The bank, also suggests some precautions for customer protection, especially from phishing [9]:

-If you are logged into the Internet bank, you should never leave your computer unlocked and the security token inserted inside the USB port or your desk list of codes for single need.

-With temporary leaving your computer, you must lock the computer, and take the list of the disposable codes or security token with you,

- Never write down your user account, password or PIN access, to paper placed in your wallet phonebook or on your mobile phone,

- The password must be at least 8 characters, that must consist of at least three characters of the following four groups of your free choice (small letters, large letters, digits and special characters.)

- Not login to the Internet bank from computer given to public use (example: Internet cafes) or computer kept

and maintained by strangers,

- Use licensed software. If your finances do not allow you, seek alternative sources like so called open source applications.

Finally, NLB "Tutunska banka" has successfully implemented the e-banking system for private subjects and individuals. The bank through its solution for electronic commerce (e-banking) made payments in electronic mediation selling products and services on card transaction basis. This solution is unique in the Macedonian market due to the possibility of accepting payments with credit cards two biggest international credit card brands:

-MasterCard Worldwide and

-Visa International,

-Diners Club (according the specially regulated contract with Diners Club – Macedonia)

-and some domestic credit cards issued by the Macedonian banks.

Retailers use the e-banking system of the NLB "Tutunska banka", which allows them to conduct the sales transactions in two ways [10]:

- Sales transactions where payment is made in one step (single message) – where the funds are collected from the card at the time of conducting the transaction

- Sales transactions where the payment is made in two steps (dual message) - in this case the implementation of the transaction actually performs reservation of resources, with subsequent confirmation by the sale (at the time of delivery of the goods or services, that are purchased through the Internet) are charged from the clients account.

According to the previous statements, we can conclude that the e-banking system is important mark in the Macedonian financial and banking sector, with both advantages, and disadvantages, that have to be successfully managed in order to eliminate the possible threads (such a possible financial crisis, losing confidence etc.), and to develop a financial innovation society, in association with the latest trends.

VI. CONCLUSION

Modern living conditions determine changes and innovations that are expressed in all aspects of human life. Determinants derived primarily from the development of information technology which is implemented in the manner of operation and functioning of companies. Banks as institutions are known as major users of this technology. Adoption and implementation of information technology enables new interactive processes that creates closer collaboration between banking services and customers eliminating all barriers that exist in the communication operation.

Applying information technology, banks create special own brand different financial market, expanding the number of services and the time required for their satisfaction. Characteristic is the trend of continuous innovation in banking operations, which is produced by

the development and innovations in information technology eliminating spatial and temporal barriers in the classic way of functioning prove to be obstacles, creating a new path without constraints in meeting the service needs of customers. Let us hope that continued development in this area, which would be constantly modern will bring new ways and procedures in the creation of services and satisfaction of customer needs.

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Application of CobIT at College for Information Technologies

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Abstract - The topic of this paper is the application of CobIT at the College for Information Technologies, Zagreb, Croatia. Considering that we have used this method for the first time in the assessment of the state of the information system of a company, it's believed that this material, with all the necessary mistakes, will not be understood as an audit but as an advice on how to apply certain control measures.

I. INTRODUCTION

Many IT projects do not fulfil the expectations of their investors and many of them are not completed but stopped immediately or sometime after their beginning. On the other hand, the projects that do see their implementation and application are a financial and time-consuming burden for the organization. All this is a result of the fact that business processes based upon a new information system are far more exposed to high risks, either because of poorly carried out projects, or because of bad information systems managing in general.

In order to avoid the totality of problems of information technology performance, the management should primarily answer three basic questions:

- Is there a problem with information technology,
- To what degree is the management involved in information technology application, and
- Does the management participate in the assessment of the state of information technology and its guidance?

All the answers to these questions should be summarized to one: information technology needs managing. This directly means that it is necessary to apply expensive technique and method with which the management and chief executives control the application of IT domain in the overall business, in decisions to invest into IT and in performances and risks of its use. In the end, it also means taking responsibility for controlling the implementation of IT processes and activities, in order to avoid any unwanted problems backfiring on IT managers.

In that way we come to different parties interested in Integrated information technology management [1]:

- the management,
- IT management,
- business management,

- IT auditors and,
- services in charge of risk and safety.

Assessment models of IT domain quality are different and realized by:

- CobIT (Control Objectives for Information and Related technology),
- ITIL (IT Infrastructure Library),
- Six Sigma,
- CMMI (Capability Maturity Model Integration),
- ISO norm and so on.

College for Information Technologies in Zagreb, Croatia (in further text referred as VSITE) is a new institution of higher learning that manages to cover the majority of business functions with a relatively small number of people (classes and work with students are not included). This implies that, according to the RACI matrix, more business functions are performed by one person. Without considerable involvement of IT, this would not be possible. So far, VSITE has not planned auditing its IT processes by using CobIT as the standard module.

II. BASIC FACTS ABOUT CobIT METHOD

CobIT (Control Objectives for Information and related Technology) defines the framework for the way of implementation and the managing of information and communication systems and technology. It is a non-commercial product or services packet [2]. The first version was issued in 1966 as a project conducted for Information System Audit and Control Foundation, an institution founded by ISACA (Information System Audit and Control Association), and an international professional association for auditing and supervising the performance of information systems. The members of ISACA are experts from all over the world that deal with managing, controlling and auditing information systems and their safety. ISACA founded IT Governance Institute (ITGI) for the purpose of improving and forming standards and publications in ICT systems managing domain. The development of CobIT was very quick. Hence, in 2000 version 2 appeared, in 2004 version 3, and in 2007 version 4. The current version is 4.1 [3].

CobIT contains 4 domains, 34 crucial information processes or control objectives, over 300 detailed information controls, 18 application and 6 process

controls. For each of the 34 IT processes, the following is provided:

- Maturity models (0-5),
- Critical success factors (CSF),
- Key goal indicators (KGI),
- Performance monitoring guidelines for the management and Key performance indicators (KPI),
- Risk managing guidelines for the management (RACI matrix),
- Control objectives and control tests.

The basis of CobIT framework are 34 key information processes or control objectives that are divided into four domains:

- Planning and Organization (PO), consisting of ten processes:
 - Strategic IT planning,
 - Information architecture,
 - Technological directions determining,
 - IT processes, organization and relationships,
 - IT investments management,
 - Communications management,
 - IT human resources management,
 - Quality management,
 - IT risk assessment management, and
 - Project management.
- Acquisition and Implementation (AI), consisting of seven processes:
 - IT solutions identification,
 - Acquisition and maintenance of application software,
 - Acquisition and maintenance of technology infrastructure,
 - Production and use enablement,
 - IT resources acquisition,
 - Changes management,
 - Solutions and changes installation and accreditation.
- Delivery and support (DS), consisting of thirteen processes:
 - Service levels defining and management,
 - Third-party services management,

- Performance and capacity management,
- Security of IT services continuity,
- IT systems security,
- IT expenditures identification and allocation,
- User education and training
- Service desk and incident management,
- Configuration management,
- Problems management,
- Data management,
- Physical environment management, and
- Process management.

- Monitoring and evaluation (ME), consisting of four processes:
 - Monitoring and IT processes evaluation,
 - Monitoring and internal controls evaluation,
 - Regulatory compliance
 - IT Governance security

For each process, there is one control objective of the highest level, and between 3 and 30 detailed objectives.

Maturity models define metrics and objectives set by measuring information process performances, which all helps in processes management. Thereby, levels 0-5 are assigned. Levels are in accordance with the criteria that should be respected when assessing each maturity model.

0 – Non-existent. In a given segment, there are no elements that would lead to the conclusion that there is an initial level of IT management.

1 – Initial. Shows that the organization has recognized some problems in IT and the need to address them. Standard processes are not yet defined, but ad hoc approach is applied either by an individual or a group. IT monitoring is activated as a response to an incident which has caused either loss or embarrassment to the organization.

2 – Repeatable. Processes are performed in an expected way, and individuals or groups repeat them. But procedures of process development are not documented. Their performances rely on the knowledge of every individual that is to perform them. There is a global awareness of problems in IT management whereby performance indicators are not sufficiently developed; indicators being IT planning, delivery and monitoring processes. The management has identified basic methods and techniques of IT managing. However, the process is not adopted consistently throughout the organization. There is no formal training or communication on

governance standards, the responsibility rests with individuals.

3 – Defined. Procedures are standardized and documented, and their performance efficiency is measured periodically. The need for action in the sense of IT managing is well understood and accepted. IT governance indicators are defined and there is a connection between result measurements and performance improvements. All this is documented and integrated into the processes of strategic and operative planning and monitoring, which leads to the conclusion that procedures are standardized documented and implemented. The management communicates through standard procedures and informal training is set. Efficiency indicators of IT management are documented and analysed which leads to enterprise-wide improvement.

4 – Managed. It is possible to monitor and measure the parameters of procedures performance. There is a continuous improvement of processes. Many controls are automated and regularly checked. There is a partial use of control automation tools. Problems at all levels are fully understood and the system is supported by formal training. Customers (users) are well known and responsibilities are defined and supervised. IT processes are compatible with business and IT strategy. Process improvements in IT are based on quantifiable understanding and it is possible to monitor and measure the compatibility of procedure and process measurements. The owners of all processes are aware of the risks, the importance of IT and the opportunities it can provide. The management has defined the limits inside which the processes have to be carried out. Actions are taken in many, but not all cases where processes do not function efficiently. The processes are being gradually improved with the help of practical experiences. Causes are standardized. IT governance has become an enterprise-wide process. Activities of IT governance are becoming integrated with the enterprise governance processes.

5 – Optimized. Complete risk and implemented controls program exist. Risk management is integrated into the overall program of the organization. Controls are automated and supervised, whereas the employees are actively involved into the control improvement program. There is an advanced and forward-looking understanding of IT managing problems and solutions. Training and communication are supported. It is an organization where people and processes quickly adapt and the demands of IT governance are completely fulfilled. All the problems and deviations are analysed with fast identification and initiation of efficient actions. IT is used in an integrated and optimized manner in order to automate workflow and provide tools to improve quality and effectiveness. Enterprise and IT governance are strategically connected; by using all the resources, the competitive advantage of the enterprise is increased.

Levels formed by maturity models help in pointing out weak spots in information process management and actions that should be taken in order to increase the level. Based on maturity models and all 6 levels, maturity attributes are defined. Zero (0) is excluded from the process. The attributes are [4]:

- recognition of the need to manage processes and communications,
- regulations, standards and procedures,
- skills and expertise,
- jurisdiction and responsibility,
- objectives definition and measurement.

A framework defined by CobIT can be represented by a cube. The cube sums up all the information defined by the CobIT framework. The cube has three sides containing objectives, resources and activities which means that, in that way, business requirements, IT resources and IT processes are connected.

- Realization of business objectives is achieved through following demands:
 - Efficiency,
 - Confidentiality,
 - Integrity,
 - Availability,
 - Reliability,
 - Compliance.
- These demands can be realized through IT processes:
 - which are divided into domains,
 - for the implementation of which, certain activities are needed.
- Before-mentioned IT processes refer to the following resources:
 - Applications,
 - Information,
 - Infrastructure,
 - People.
- Each of the processes is set in 4 domains:
 - Description of the processes in the dropdown form
 - Control for the processes
 - Inputs and outputs of the processes, RACI matrix
 - Maturity model of the processes.

III. THE USE OF CobIT AT VSITE

A. Basic facts about VSITE

College for Information Technologies (Visoka škola za informacijske tehnologije - VSITE), organizes and performs professional studies of information technologies according to the Professional studies of information technology establishment study, positive remarks of the National Council for Higher Education and the permanent licence of the Ministry of Science, Education and Sports dating from October 12, 2006.

Professional studies of information technology consist of 180 ECTS. A person that finishes the studies earns the title of professional bachelor of information technology.

Professional studies for regular students last for three years with the load of 60 ECTS per year. Professional studies for part-time students last for four years with the load of 40 ECTS per year in the first three years, and with the full load (60 ECTS) in the fourth year.

The college employs 14 people, including 11 teachers. Another 60 teachers work on part-time contracts.

School fees are paid in full amount according to the number of ECTS points. Besides school fees, admissions test expenses are also paid. Enrolment fees do not exist.

Classes for about 350 students, which would be the present number, are given by 70 teachers. Students get all the required literature in e-form and can download it from the official college web page. It is not the only form of literature available to students for free. So far, two books have been published in print, two more are in print, and several other are planned.

It should be pointed out that all students get a laptop for the price of one ECTS point, which they can use during their studies and substantially improve its efficiency.

B. Technological infrastructure

It can be divided into two parts:

- The equipment used in VSITE classrooms
- The equipment in possession of students

Communication is established through a 100 Mb Ethernet network and a Wireless network.

C. Application support

VSITE uses its own application for keeping track of the classes, MS Share Point for storing documents. Bookkeeping is used as a service.

D. CobIT method implementation

Considering that VSITE is a small college, all 34 processes covered by CobIT are not important to the same extent for an integrated information system management. For that reason, only areas perceived as having extreme importance for the functioning of both IT and general business process are chosen:

- Planning and organization
 - PO1-Strategic IT planning [TABLE I.],
 - PO2-Information architecture [TABLE II.],
 - PO9-IT risks management [TABLE III.],
- Acquisition and implementation
 - AI3-Acquisition and maintenance of technological infrastructure [TABLE IV.],
- Delivery and support
 - DS1-Service levels defining and management [TABLE V.],
 - DS4-Security of IT services continuity [TABLE VI.],
 - DS7-User education and training [TABLE VII.],
- Monitoring and evaluation
 - ME1-Monitoring and IT performances evaluation [TABLE VIII.]

Based on the aforementioned, IT audit is conducted on key processes or on those perceived as risky from the business aspect.

TABLE I. PO1 - STRATEGIC IT PLANNING

IT process and supervision questions	State	Recommendations
Is there a strategic plan and when was it updated? Is strategic IT plan documented? Does every change in one plan update the other? Is the influence of risk on IT objectives and resources clearly set out? Do tactic IT plans exist and what is their connection to strategic IT plan? Are the transparency and the understanding of IT costs ensured together with strategy, strengths, weaknesses and levels of service?	Strategic plan was documented and updated in 2009. Strategic IT plan is not documented. It is not documented but exists in casual form, not as a document with a number and so on. Strategic decisions concerning IT plan are made from one project to another. The definition of overall risks does not exist, but risks are defined according to every particular objective. If the case in point is getting notebooks, computers, moving servers, or making certain segments of applications. Tactic plan is made for the period of one semester, considering activity needs that exist in the particular semester. The exception is the work on SCAD, for which	Continuous update of the strategic business plan. It is necessary to make strategic IT plan (document it) and update it according to the changes that are happening in the domains of business and IT environment. It is necessary to continuously keep track of student feedback about their satisfaction and implement those information into planning. Tactic IT plans should come from strategic IT plans. According to the strategic IT plan, strategic IT decisions have to be based on the unmistakable measurements to what extent the current condition of the IT domain can ensure unobstructed work of the college, and

	there is a complete plan, but it cannot be called strategic. Fee payments play a crucial role in this case. Accordingly, new expenditures and investments are defined.	especially communication and the awareness of the students..
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TABLE II. PO2 - INFORMATION ARCHITECTURE

IT process related questions	State	Recommendations
To what degree are the applications integrated in the business process? Is the information model clearly set out? Are information and the information model accurate? Is the responsibility for information delimited? Are standards of information technology documented? Is the number of incidents caused by inconsistent information model being tracked? Are there continuous reports about the use of the information architecture?	The importance of the information architecture model is standardized and documented but is not measured often enough It is not a part of the strategic IT plan. The responsibility for the information architecture is defined. Formal administrator of information does not exist. An informal one exists inside the programming team. Reporting about the use of the information architecture is not set.	An information architecture model should be compatible with the strategic business plan and the strategic IT plan. An information architecture model should be compatible with the strategic business plan and the strategic IT plan. It is necessary to set new securities of all information. To define and implement procedures in terms of information integrity and consistency. To establish reporting about the use of the information architecture.

TABLE III. PO9 - IT RISKS MANAGEMENT

Process related questions	State	Recommendations
Is the IT risks management framework set with regards to organizational risk management? Is the context of risk assessment set? Are the causes with regards to IT objectives defined? Are the criteria for risk assessment laid down? Is the plan for risk treatment supported and supervised?	The framework for IT risk management is not set. The context for IT risk assessment is not set either. Events that have the negative influence are identified. Action plan for critical IT risks exists. Risk treatment is being carried out expectedly while individuals and groups are able to perform the procedures repetitiously. IT risks are considered on the ad hoc basis. Risk management is usually at a high level solely in the most	To set a risk management framework that is coordinated with the risk management at the entire college level. To define events with a potentially negative influence on objectives or operations that are in progress at the college, and to standardize the procedure. To determine the nature of objective influences and keep a record of them. To record and keep all the relevant risks in risk database.

	important projects. A reduction in risk only follows after the risks have been identified.	
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TABLE IV. AI3 - ACQUISITION AND MAINTENANCE OF TECHNOLOGICAL INFRASTRUCTURE

Process related questions	State	Recommendations
Is the methodological framework for acquisition and implementation set? Are the acquired applications compatible with the business plan? Is the development and the testing of applications being separated? Are the functionalities developed and documented according to the designed solution? Is the price of the application determined in practice (maintenance)? Is the number of applications that show no problems in the implementation phase registered?	Documents about acquisition and maintenance of the technological infrastructure exist. Documented approach exists only in the case of big projects. It is sometimes turned into inactive documentation by copy-pasting. Development and testing of the applications are not separated. Functionalities in principle follow the designed solution.	Development methodology should be documented in full, not only in the case of big projects. The phase of development should be separated from testing. However, if it is not possible (small projects), the plan of testing should be precisely defined in every aspect and performed according to the project plan. Special attention should be paid to development methodology from the aspect of design, procedures and documentation. The methodology should be realized in a defined way. Development methodology should ensure instructions on how to use the applications.

TABLE V. DS1 - SERVICE LEVELS DEFINING AND MANAGEMENT

Process related questions	State	Recommendations
Is the framework with formalized levels of services between end-users and service providers defined? Is SLA made for every critical IT services based on the needs of users and IT possibilities? Is it defined via OLA how the service should be performed optimally in the technical sense, as SLA support? To what extent are the owners satisfied with the level of service? Is there a procedure for	Levels of services are defined. The comments of end-users are systematically documented and monitored. According to them, possible corrective measures are taken. Complaints database is kept. However, it is not a completely continuous process. Supervision of service performance is not documented. Reports (written) are made only in incident cases. Potential delays in provision of services are defined but not documented in any way. Statistics of service satisfaction is not	It is necessary to ensure continuous feedback from end-users and it should be continuously registered. It is necessary to document SLA. Basic components like availability and reliability of services, forms of services during after-hours and so forth, should be included in the contents. Services improvement plan should be created. Services catalogue should be continuously updated. Responsibility of each level of service providers should be defined.

keeping track of end-users' satisfaction with provided services? Is services catalogue made and coordinated with business objectives? To what extent are the users satisfied with the level of provided services?	kept. Services catalogue is not made.	
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TABLE VI. DS4 - SECURITY OF IT SERVICES CONTINUITY

Process related questions	State	Recommendations
Is the formal framework created by which an IT service is defined as a continuous process? Are critical resources that should ensure the continuity of service providing defined? Is IT continuity plan defined? Is the IT service providing plan being tested?	From the continuity aspect, IT services domain is at the very beginning. There is not even a consideration about it. There is no training evaluation. There are no defined critical resources from the aspect of continuous end-user training.	It is necessary to make a framework of service users at the highest level, to categorize it and, according to that, provide a continuous long-term training for the same. It is necessary to measure service providing continuity.

TABLE VII. DS7 - USER EDUCATION AND TRAINING

Process related questions	State	Recommendations
Is there a user training plan? Is the user training plan respected? Is there feedback about satisfaction with end-user training? Have the best methods for training execution been identified?	The need for a training plan has been identified but it is still on initial level. When training does occur is in relation to new program versions. Sometimes the new user is „forgot“, so his training is connected to on-line help.	To make a plan of training that will be defined for two basic groups of users: students and teachers. To measure the level of user satisfaction with the training provided.

TABLE VIII. ME1 - MONITORING AND IT PERFORMANCES EVALUATION

Process related questions	State	Recommendations
Is the supervision of business processes formalized? Are there reports necessary for the management? How up-to-date is the knowledge of the management about problem escalation? How much is the	The approach to the supervision and evaluation of IT performances is on cognitive level. Supervision is provided for key IT projects. However, there is no parameterization of the supervision.	To establish a system of supervision and evaluation of IT performances. To define the ways for data acquisition and the methodology of management informing. In initial phase, apply it to crucial processes. To identify and implement actions for

management satisfied with the level of IT performances?		the improvement of IT performances.
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IV. CONCLUSION

VSITE, being an institution of higher learning, sees IT management as one of its most important assets. An assessment of the state with recommendations has been made for only 9 processes. The processes in question were deemed as more important than the other 25. However, VSITE will pay considerable attention to the assessment of the state of many more projects in time to come. RACI chart will be globally approached in order to determine the levels of responsibility for certain business processes. As we have mentioned earlier, VSITE is a small institution so that multiple activities in business processes are performed by only one person. For the 9 previously mentioned processes, RACI chart will be made soon in order to get a more precise image of overall activities of every employee. In any case, VSITE can only benefit from such an assessment.

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Electronic Map as a Tool for Decision Making in Local Governments

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Abstract - Maps are the most acceptable way to present data which are connected with space, with location. When the Internet and Information Technology appeared they completely changed the way of using maps, transformed the procedure of making, distribution and analyses. The Internet and Information Technology made the Geographic Information System to be born. We could say that Geographic Information System, GIS is a complex multiple system of maps. Maps with different ratio and context and with possibility to input on it unlimited amount of information and to make different kind of analyses. These are maps where we can choose which information has to be shown at the time and where graphic and tabular data are connected. In local government different activities are performed: tax payment, agricultural land management, investments, environmental protection, activities of communal police, urban planning, emergency situation, etc. all these activities are connected with location and need maps to show and analyze data they are working with. Maps in GIS with the Internet and Information Technologies help these tasks to be successfully done. Electronic maps are useful tools for decision making in local government.

I. GIS CENTRE OF THE CITY OF ZRENJANIN

A year ago GIS centre of municipality of the city of Zrenjanin was established. These center is equipped with hardware and software which are required for development of GIS. Many training have been held as well.

The IT system of the GIS Center is a combination of the Web based Open source (Debian Linux/Apache/MapServer/PostgreSQL) 3-tier system with Intranet/Internet and Extra-net domains and of classic client-server data production and complex analysis GIS workstations with commercial (Map Info, ProgeCAD and Auto-CAD) and Open source (QGIS) desktop GIS software. The GIS Center is connected to the main IT system of the local government through the Active Directory, integrated with the centralized backup system and also connected to the main Microsoft SQL database servers and the tax departments Oracle RDBMS. The system was built to be cost effective, to provide system wide GIS data distribution and sharing

and to establish a sustainable and expandable GIS data production environment.

The GIS Center is now equipped with the wide format (A0) color scanner and 3 semi-professional hand held GPS devices with additional high-precision receiver for data capture services and with a wide format (A0) color plotter for printed publication production. The data capture capabilities of the wide format scanner had immediate global effects on the important digital data portfolio of the City. It is fundamental for the local experts at GIS Center to gain experience with the pre- and post processing of the incoming analogue and digital data. The floating license of the GPS post-processing software shared through the local Extra-net network with the local enterprises (contracted members of the GIS Center) makes the survey data integration more professional and extends the total data processing capacity.

The basic digital data library of the GIS Center was assembled by purchase of scanned raster of the land registry plans from Republic Geodetic Authority, by the donation of the Republic level CARDS project of the high resolution (10, 20 and 40 cm) ortho-photography and from local resources. For the local GIS stuff it is fundamental to understand and recognize the importance and the power of the high-precision aerial photographs, to understand the benefits of vector digitized data, to get familiar with the spatial data visualization methods, to produce specialized digital databases and thematic maps, to continue with development through guided trainings with GIS expert support and to apply for financial sources through project building.

II. MAPS - FROM STONE CARVING TO GEOGRAPHIC INFORMATION SYSTEM

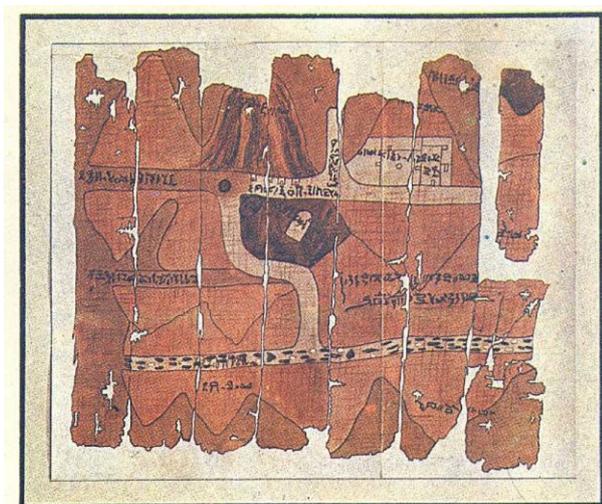
Maps are made to represent spatial data. When the Internet and Information Technologies appeared they completely changed the way of using maps, transformed the procedure of making, distribution and analyses



Picture 1. - Map on clay Nippur, Babylonia circa 1000 B.C.

First maps were made in prehistoric time, carved in stone, drawn on papyrus, parchment, paper and finally got digital form. They were made in Babylonia, Old Egypt, China, Ancient Greece and Rome, during the Age of Discovery until the present Day.

First maps were simply, primitive but they have been following the develop of civilization and improve itself.



Picture 2. - Old Egypt, Map on Papyrus ca. 1400-1200 BCE

When the Internet and Information Technologies appeared, maps found their way to improve themselves using these new technologies. The Internet and Information Technologies made the Geographic information System to be born.

We could say that GIS is a complex multiple system of electronic maps. Maps with different ratio and context, with possibility to input on them unlimited amount of information and to make different kinds of analyses. Maps, where we could choose which information have to be shown at the time and where graphic and tabular data are connected. All of these would not be possible without information technologies.

Maps are still here, and they are used by Local governments. They are the most acceptable way to present data which are connected with space, location. The power of maps is that they are presentation of how people's imagination sees spatial information. If somebody wants to see and understand spatial data he must put the data on a map

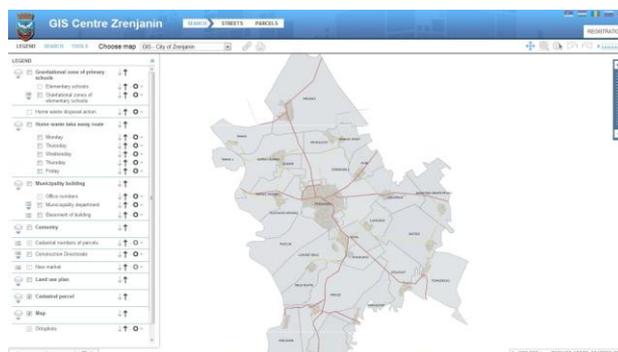


Picture 3. - Digital maps of GIS of the City of Zrenjanin done in MapInfo program

With the Internet and Information Technologies data are generally transformed from analogue, paper format into electronic, digital form. We all know what the benefits from digital information are and how the information could be useful. Digital text information could be copied, corrected, edited, fonts can be changed. We have the same benefits from digital map in comparison to analogue.

III. DIGITAL MAPS IN LOCAL GOVERNMENTS

In local government following activities are performed: tax payment, agricultural land management, investments, environmental protection, communal police, urbanism, emergency situation, etc. All these activities are connected with space and they need maps to show and analyze data they are working with.



Picture 4. - WebGIS portal of the City of Zrenjanin is available via global network at gis.zrenjanin.rs

Local governments produce a lot of information, some of them are spatial and citizens want to be informed about some of these data. In local government of the City of

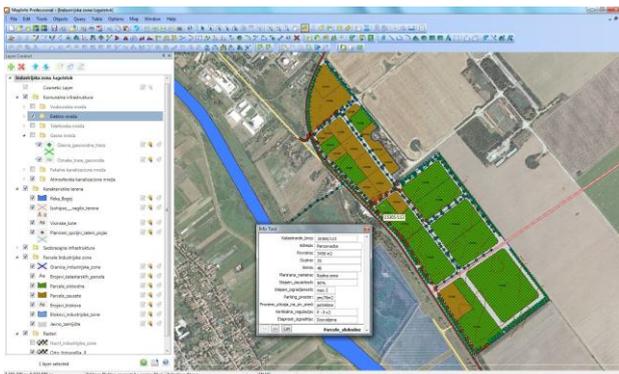
Zrenjanin we have already made WebGIS portal where these kinds of information have been presented on the map. These maps show parts of the city where there are going to be planned power cuts, route of collecting home waste, gravitational zones of schools, air pollution, etc.

In Eastern Europe local governments have a lot of parcels of agricultural land in their ownership. These parcels are given to farmers through process of auction. Only in the municipality of Zrenjanin there are around 12 000 parcels of agricultural land. This is a lot of land and many of these parcels don't have its name or address. They only have cadastral numbers but when we say "parcel number 2325/2"; nobody knows where it is in real world. This parcel must be marked on a map and then everybody will know where it is.

Before digital, computer maps existed these parcels were drawn on a dozen of paper maps. These maps were distributed to potential renters of agricultural land.

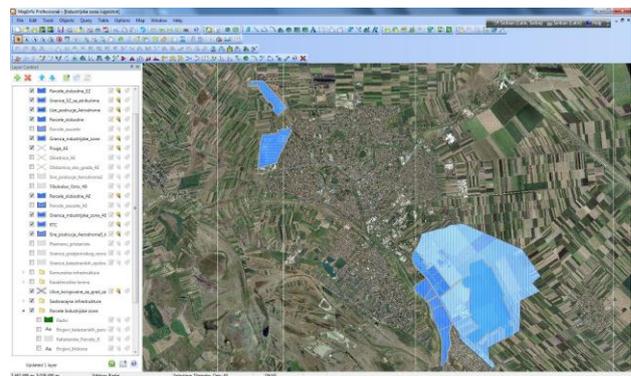
Then electronic maps appeared and everything became easier. Electronic maps within GIS enable that parcels of agricultural land in local government ownership could be marked on one electronic map instead of on a dozen of paper maps. They enable search option of the cadastral number of the parcel instead of trying to find parcels manually on a paper map, which saves a lot of time. On an electronic map we can change symbols of objects, shape of parcels, with a simple click on a parcel lots of tabular information appear, or we can click on a record of a parcel in the table and the chosen parcel will be zoomed in on the map. We could make thematic maps like map with all parcels with the highest quality of the land, or a map of land which didn't get a new renter after auction. The parcel which hasn't been rented after an auction could be presented via the Internet and all necessary information about it could be presented to a potential renter. The Internet could help in distribution of the maps with parcels to renters before auction as well. These maps could be only one click away from their potential users.

Digital maps of agricultural land in state ownership of the City of Zrenjanin are under construction.



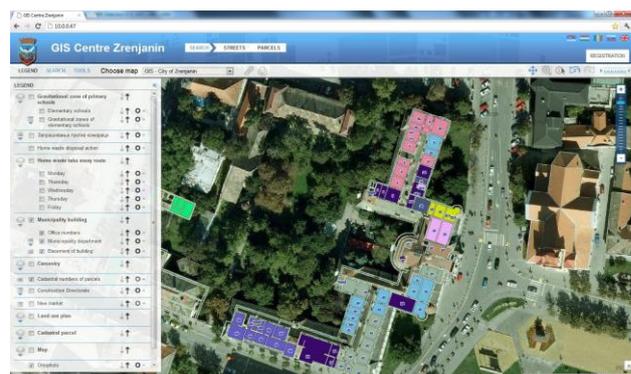
Picture 5. - Connection between tabular and graphic data of agricultural land on the map

The City of Zrenjanin has strong interest to attract foreign investors therefore 3 greenfield industrial zones have been built. Local government is someone who is supposed to be contacted by investors and they have to be equipped with exact, clear, up-to-date information about which parcels are reserved and which still not, where they are located, what are the routes of utility networks (sewerage, gas pipe lines, water pipe lines...) all these information can be clear only if shown on a digital map. In local government of the City of Zrenjanin, Department of Information and Communication Technology, GIS of industrial zones have been made and it is visible via the Internet all around the world.



Picture 7. - GIS of industrial zones of the City of Zrenjanin

Communal police is a part of the local government. They have a list of objects which they have to take care of. There are lampposts, monuments, phone boxes, playgrounds, sports grounds and lots more. All these objects have to be presented on the digital map to help communal police chief to organize communal policemen and then help to locate and note potential, disappearing, breaking, damage, etc. The Internet technology can enable the information to be shown to the citizens via WebGIS portal so that they can click on the map on the object and register if something is wrong with it. These objects don't have its name, e.g.lampposts don't have their name, they just have the location and a map is the only way to mark the location.



Picture 6. - GIS of the building of local government

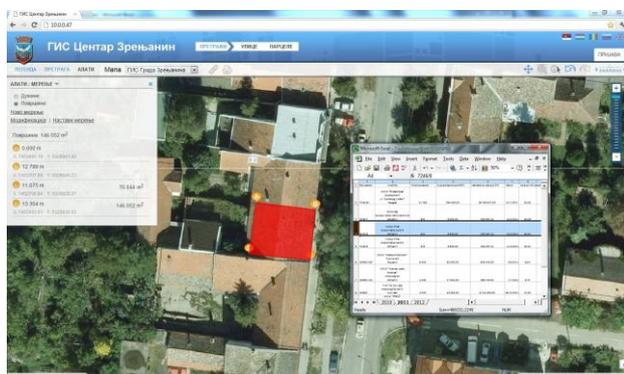
GIS mustn't show the whole territory of a city, not even part, but only one building. GIS of The city of Zrenjanin has layers of data of the building of the local government. Through these layers citizens can see which office they have to go to in order to get documents they need.

Environmental protection is another field which is strongly connected to location and is subject of interest to the local government. Across the city there are a number of monitoring stations which have collected information about level of air pollution. If concentration of some substances goes over the maximum allowed level then citizens have to be informed. There isn't a better way to show area which is contaminated than to present the location on a digital computer map and via the Internet and WebGIS portal of the City of Zrenjanin our citizens could be informed. Areas contaminated with ambrosia pollen, or is treated by substances against mosquitoes are also in jurisdiction of the local government. All the information have to be shown on WebGIS portal.

Emergency situations need fast reaction so they are in jurisdiction of the local government as well. Evacuation lines, places where citizens have to be gathered, potential zones of flooding are also connected with location and could be presented on WebGIS portal.

Activities which are connected with urbanism are also area of interest of the local government. Urban plans of future development of the city are also presented on the WebGIS portal.

Collecting of local taxes is also something that is strongly connected with space. Records of the tax payers are often not updated. With GIS technology the local government could solve the problem by comparing orthophoto with tabular records.



Picture 8. - Orthophoto and tabular records of tax payer

GIS digital maps help local government employees, who operate with real estates in local government's possession, to perceive spatial order of buildings.

All activities in implementing GIS into the local government and other public institutions are governed from GIS centre which is formed within the local government of the City of Zrenjanin



Picture 9. - Parcels of plots of the city of Zrenjanin

IV. CONCLUSION

Maps as the best way of presenting spatial data have existed since the earliest civilizations. On maps we simulate spatial relationship from real world. Local governments make and use data which are connected with location. Putting these data on a map enables us to understand and analyze them which is crucial in process of decision making. The Internet and Information Technologies have completely changed the way of using them, transformed the procedure of making, distribution and analyses of maps. These analyses help us to understand spatial relationships which could be the most important in process of decision making. Internet technology make it possible to share graphic data with other user via WebGIS portals. On the portal citizens can contact local government's departments which make communication on relation government – citizens to be better.

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Mobile Virtual Network Operators in the Electronic Communications Market

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Abstract – The topic of this paper are trends in the mobile market and conditions for entry of virtual mobile operators..Definitions and descriptions of the types of virtual mobile operators and their impact on the market are given. The results achieved by virtual mobile operators and their current market share in the world and in the neighboring countries are presented, as well as the potential role of the mobile virtual operator in the Republic of Serbia.

Operators) to provide mobile telephony services in the mobile communications market [3].

In accordance with the regulations of the Republic of Serbia, MVNOs can be defined as entities that perform electronic communications, and provide mobile services without a license for a licensed frequency band, using the resources of an existing mobile operator.

The services of mobile virtual operators are offered in the same way as services of licensed mobile operators (including the possibility of displaying virtual operator’s logo on phones). MVNOs are emerging in the market of mobile communications as independent operators with certain rights as to various types of commercial contracts with end users, operators, and possibly other obligations towards MNO.

I. INTRODUCTION

The mobile telephony market has shown constant progress in the previous period, both regarding the revenue generated from the traffic and the number of users. However, with penetration exceeding 100%, the market is becoming saturated, making it very difficult for mobile operators to retain the existing customers, and even harder to increase the number of users on the basis of the existing services. To achieve growth (in terms of revenue and number of users), it is necessary to offer new services to the market, which enables the emergence of mobile virtual operators - MVNOs. In most cases it leads to increased competition and revenue in this market.

B. Types of MVNOs

MVNO operators can be classified in several ways, according to the infrastructure aspect (i.e. dependence of the MNO), the scope of services offered, and connectivity with the operators of the national and international market. Figure 1 shows the elements constituting the MNO and MVNO operator.

II. DEFINITIONS AND TYPES MVNO

A. Definitions

There is no standard definition of an MVNO. The International Telecommunication Union (ITU) official documents define MVNO as an operator providing mobile communication services to users without owning licenses to use the radio frequency spectrum [1].

The regulatory documents of the UK regulatory body of electronic communications, OFCOM, define MVNO as an organization that doesn't have a license for the allocated frequency spectrum and provides voice telephony services to users of mobile communications [2]. MVNO pays compensations to licensed mobile operators for using their mobile networks.

MVNO is a mobile operator that uses a portion of the radio frequency spectrum and network infrastructure (fully or partially) of licensed MNOs (Mobile Network



Figure 1. MNO and MVNO elements

MVNO type 1 (Branded Reseller) provides services by complete use of the network infrastructure of the partner MNO. Terms and conditions for leasing resources are defined by contracts signed between the MVNO and the MNO. The virtual operator’s cost of investment and risk are minimal, including just the costs of marketing, selling and distribution. This operator can use its own brand or the brand of the MNO. The MVNO offers the same services offered by the MNO, at prices

defined by the contract signed with the MNO. Revenues are shared according to predefined percentage. An example of this type of MVNO operator is Sainsbury in the UK, which depends entirely on the licensed mobile operator O2 regarding access to the network, origination and termination of calls, SMS and MMS sending, roaming, etc.

MVNO type 2 (Service Provider) offers its own SIM cards and creates a range of services based on its own applications, such as banking transactions, requests for service information, etc. The price of services for end users is affected by the MNO's wholesale prices. MNO also sets the terms of interconnection with other operators. Income is generated by the traffic originated by their users. The costs include: costs for wholesale access service, marketing, sales and distribution. An example of this type of MVNO operator are Energies from the UK, Sense Communications from Sweden and others.

MVNO type 3 (Enhanced Service Provider) is the operator which has some infrastructure elements: HLR (Home Location Register) and MSC (Mobile Switching Center). Beside basic services, it offers supplementary services as well (gaming, entertainment, paying options,...). It has its own intelligent platform that enables a high level of flexibility and can provide different services compared to those offered by the MNO. MVNO provides customer care and the billing and collection system. It offers its own SIM cards, so service prices do not depend on the MNO directly. Revenues are generated by user traffic and costs include: the costs of network equipment and platforms for various services, the cost of wholesale access service, marketing, sales and distribution. Examples of type 3 MVNO operators are Virgin Mobile and One Tel in Great Britain.

MVNO type 4 (Full MVNO) has its own network elements (HLR, MSC, Gateway Mobile Switching Centre - GMSC), offers its own SIM cards, performs independent traffic routing and creates services for its customers. The service prices is created autonomously. Revenue is the result of traffic of its own users, while the costs include: the costs of network equipment and platforms for various services, the cost of wholesale access service, marketing, sales and distribution. Tele2 Norway is an example of the type 4 MVNO.

A specific virtual operator type is the Mobile Virtual Network Enabler - MVNE. MVNEs are intermediaries between MNOs and MVNOs, they do not have a licensed frequency spectrum, but they offer technical infrastructure (HLR, SMS-C, MMS-C, SGSN - Serving GPRS support node, GGSN - Gateway GPRS Support Node), service charging, administration, technical support. They are not directly related to the end-users.

According to their core business, MVNO operators can be operators in the electronic communications or companies outside the sector. Electronic communications

operators have an interest to expand their business into mobile communications market and offer service packages (3- play or 4- play). In addition to mobile network services, these packages provide voice over fixed line, Internet and media distribution services. These operators have their own user base and mostly constituted as MVNO type 4.

Companies outside the electronic communications sector (retail chains, airline companies, companies from the finance or entertainment sector,...) base their business model on their own customers and distribution channels, relying on a popular brand by which they are known and their consumer groups. Most of them are MVNO type 1 or 2.

III. FACTORS AFFECTING THE MVNO

Several factors are important for the MVNO entry in the market. They are: penetration level, regulatory framework, market liberalization degree, technological development state, including new technology implementation, high level of demand and population's purchasing power.

In countries where there are several mobile operators (at least three), the mobile communications market becomes saturated after a certain period of time, both, in terms of income and the number of users. MVNO is an instrument for stimulating the growth of such mobile markets. MVNO operators, with offers for the targeted market segment, contribute to the better supply, higher incomes and the development of competition.

The appearance of MVNOs in the market was preceded by penetration above 100% in most countries. The exceptions were Germany, Austria and the Netherlands, where the penetration was between 80 and 100%, but the market was stagnating. The entry of MVNO operators into the saturated market renewed growth without facing major entry barriers and investment.

The importance of regulation and regulatory framework in the emergence of MVNO operators is huge, according on European experiences. Regulatory bodies can affect the appearance of MVNO by direct interventions, recommendations, and/or by creating the conditions for an MVNO entry.

Direct intervention means strictly defined regulations related to imposing obligations to licensed mobile operators to provide access to the MVNOs and to regulating prices. Many technical and commercial aspects have to be taken into consideration when these acts are adopted. This type of regulatory framework was implemented in Scandinavian countries and it was proved to be wrong. The regulators in these countries imposed mobile operators the obligation to provide infrastructure

access and set a low wholesale price. The result was a "price war" on the retail market, so some MVNO operators withdrew from the market (e.g. Orange from Sweden), while others spent several years consolidating their companies (e.g. TDC).

Regulatory bodies may *recommend* that the mobile operators provide access to mobile virtual operators, and also assist in the negotiations on wholesale prices. This is the most common regulatory approach.

The creation of a favorable market environment for the emergence of mobile virtual operators assumes the existence of competition, reference offer for access to the network and network elements, standard offer for call termination, number portability in mobile networks.

Factors that may have a positive impact on the occurrence of MVNO imply the existence of an appropriate regulatory framework and a high level of demand (especially among business customers). Reduced service launch time resulting from the use of the MNO infrastructure can have significantly positive effects, since, there are no costs of building and maintaining their own infrastructure. The funds are directed to the marketing research focused on providing services not offered by the MNO, such as personalized services, special contents, more favorable prices, etc. It is also important for the licensed MNOs to be interested in using their free capacities.

MNOs may oppose the entry of MVNOs in the market by not allowing access to their infrastructure. The explanation for this is that the infrastructure requires major investments, and that the MNO is likely to lose a share in the consumer market due to the entry of the MVNO. Another reason for the MNO's negative attitude towards the entry of virtual operators may be the fact that competition is still growing in this market.

MVNO is territorially and technically limited by the capabilities of the MNO operator, and financially by the service costs of network operators. Virtual operator's offer has to be more competitive, which is difficult due to a smaller customer base, and to the fact that the prices of its services are dictated by the MNO's wholesale prices

MVNOs' strategies for entering the market of electronic communications [4] depend on their potentials and are based on the following:

- prices (the strategy applied by companies with a large customer base and a wide sales network);
- certain market segments (students, ethnic and religious communities, tourists, ...);
- service packages (fixed, mobile, TV and the Internet, existing operators);
- value-added services (additional services that are offered to users, information, games, entertainment, ...).

The first virtual operator's task is acquiring customers. The second phase consists of both the acquisition of the new and retention of the existing customers, along with investing into new services, applications and equipment, which increases the risk of doing business. Figure 2. represents the ratio between the cost of investment and the business risk of MVNO operators.

MVNO entering the market with low investment cost and risk. It focuses on the customers, support, charge and distribution. The next level of further investment, demand for more services, parts procurement of technical equipment, the SIM card depends on the success of the first phase . Additional investments in applications and equipment (e.g. HLR, MSC, GMSC, intelligent platform and other equipment), which provides greater independence from the MNO, allows him to act in the market as a Full MVNO or MVNO type 4.

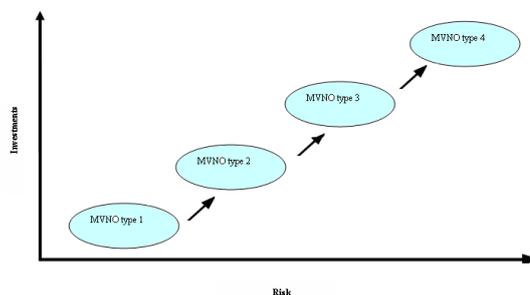


Figure 2. MVNO investments to business risk ratio

IV. MVNOS IN EUROPE AND IN THE NEIGHBOURING COUNTRIES

A. MVNOS in Europe

MVNO operators have been present for more than 20 years now. The largest number of virtual operators (58%) are located in Europe. Western European countries have the most developed markets of mobile virtual network operators. The first MVNO, Virgin Mobile, which appeared in UK, still operates today.

The MVNO share in mobile telecommunications markets in Europe ranges from 5 to 20%, depending on the country, as shown in Table 1. [5]. Their presence affects the requirements of end users. In most of these countries three to four licensed mobile operators were operating in the national market for several years. Markets were stable both from the standpoint of revenues and the number of users. It can be said they have reached a state of saturation, thus creating the conditions for the emergence of MVNOs.

Mobile operators with good business strategies, which were early adopters of virtual operators, became market leaders. They gained a significant competitive advantage,

both in revenues and number of users, over the MNO competitors that did not allow virtual operators to use their network. MVNOs are considered to be initiators of saturated markets.

Country	Number of MVNO operators	The share of revenues in the mobile market, expressed in %
Netherlands	41	10-19
Belgium	24	6-9
United Kingdom	28	10-19
France	30	6-9
Portugal	5	<5
Spain	25	<5
Sweden	7	6-9
Finland	5	10-19
Denmark	36	20
Germany	65	20
Austria	3	6-9
Italy	14	<5

Table 1. Participation of MVNOs in the mobile communications markets in European countries

It can be concluded that the share of total income earned in the mobile market does not depend on the number of MVNO operators that operate in the market, but more on other factors: operating period, supply and demand, market development.

B. MVNOs in the neighboring countries

The data published about the markets in the neighboring countries show much lower participation of virtual mobile operators than in the developed markets of Europe. In Slovenia, there are 3 MVNOs, Izzy and Debitel Mobil (4.4% of the market), operating from Mobitel’s network, and Mercator’s MVNO that appeared recently. In Croatia, there are two MVNOs, Tomato online from VIPnet (Mobilkom Austria) network and Bonbon online from T-Mobile (Deutsche Telekom) network. In Bosnia and Herzegovina, there is one MVNO, Izzy Mobil. There are no mobile virtual

operators in Montenegro and Macedonia, even though regulations in these countries do not prevent their operation. In Montenegro, there is no specific regulation for virtual mobile operators. There have been no specific requests so far, but, through market analysis and solutions based on it, they are trying to create conditions for the existing operators to enable the MVNO operations, in case a request appears. In Macedonia, there is no difference between the virtual and licensed operators. A person who wants to be an operator or service provider must be notified by the regulator. Notification of the announcement that the operator wishes to provide services for which it is registered in the future. When a person receives confirmation that his notification was registered (entered into the registry), they can launch their activities. MVNO is obliged to sign a contract with an existing licensed mobile operator to use their infrastructure. The contract may be on a commercial basis or on the basis of the reference offer of the operators with significant market power (SMP operator).

V. MVNOS IN THE REPUBLIC OF SRBIA

A. Regulation in RS

The Electronic Communications Law [6] of the Republic of Serbia regulates the performance of electronic communication activities, as well as the obligations of operators.

According to the Rules on general terms and conditions for performing electronic communication activities under general authorization regime [7], adopted by the Republic Agency for Electronic Communications, these operators have to be recorded in the registry of the Republic Agency for Electronic Communications. They submit a notification like all other operators who perform electronic communications activities over leased networks.

B. Possible scenarios of entering the MVNO RS market

In the Republic of Serbia there are three licensed operators in the mobile communications market. The data published in [8] and related to the number of users and the revenues show that growth trend has slowed down in recent years. Based on the experiences of other countries having a similar level of development, we can expect the emergence of MVNO operators in the Republic of Serbia.

Two types of entities can be expected to enter the communications market of Serbia as MVNOs. Some widely recognized brands might want to enter the market as MVNO type 1. They would provide complete services based on the resources of an existing MNO operator. Using their own large user bases and reputation they would try to take up a certain market share. Operators that already provide one or more electronic

communications services, except mobile telephony, might also be potentially interested to become MVNOs. By including mobile services they would complete their offer and be able to create a package for their customers. These packages would include fixed and mobile voice networks, Internet access and cable television, mobile phone, or a combination of any of the above services. This would allow users to get most of the services that they need at one place. Currently, there is one operator that offers such packages. The emergence of new operators could offer similar packages to the customers, contribute to the increase in competition in the market and improve the quality of services provided.

MNO operator's investments in network infrastructure, the license and other fees they paid may be protected by appropriate regulation of the MNO and MVNO operations.

It is possible to apply asymmetric regulation in the first phase of MVNO operations, which would set certain obligations for MNO operators, defined on the basis of market analysis, cost control purposes and means of providing services that are not related to the MVNO. After the MVNOs develop their business and increase their market share (percentage should be defined, e.g. higher than 5 or 10%), these operators can under symmetric regulation, be included in the market analysis, and be imposed obligations like MNOs.

As a consequence of competition, and based on the experience of other countries, it can be expected that, if one MNO agrees with one MVNO to launch this kind of services, other MNO operators will adopt this kind of incentive to sell their capacities and increase revenue.

VI. CONCLUSION

There are two possible explanations for the greater success of MVNOs in Europe than in the neighboring countries. In Europe, MVNOs have been present in the market for a long time and have taken its better part. It is also necessary to take into account the fact that the purchasing power of citizens in Western Europe is higher, so the MVNOs had more opportunities to diversify their offerings to attract more users. However, it is important to point out the fact that a number of MVNO operators in the last 10 years retired from the market and went out of business, because they could not survive under the existing conditions .

At this moment, some operators in the Republic of Serbia show interest to start providing services as MVNOs. Appropriate regulations can create conditions for their entry into the market, but it is necessary to promptly protect significant MNO's investments in infrastructure.

The success of MVNOs and their entry into the market depends on several factors:

- what type of operator appears in the market, full or light MVNO,
- when an MVNO appears on the market (success will depend on the market's degree of saturation),
- users' potential and interest to pay for services offered by MVNOs.

At this moment, a significant share of MVNOs in total revenues from mobile communications cannot be expected. Given the consequences of the economic crisis on the consumers potential to finance additional services, significant revenues are possible in the case of creating service packages.

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Educational Process Performance Measurement and Evaluation System for Higher Education Institutions – Architecture and Functionality

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Abstract – Education presents one of the most important threads in the socio-economic development of any country which requires engaging important resources. In order to use these resources more optimally it is necessary to manage the education process, especially regarding higher education institutions. Aware of their mission and social responsibility, but also its competition which is present in this area, higher education institutions must constantly work on improving their processes. Measurement and evaluation of the educational process performance as one of the most important processes of higher education institutions should point to the success of aspirations and activities aimed at its improvement. Appropriate system based on business intelligence technologies and systems should provide necessary information for evaluation of the process execution results and provide quality support to the management of higher education institutions. This paper presents the architecture and functionality of such a system in whose implementation the authors have actively participated.

I. INTRODUCTION

Nowadays higher education is more than ever affected by fundamental changes – there is a constant search for new sources of finance, partnerships with private companies are present, competition is slowly getting the form of open market. There are multiple reasons for that, but some are specific. First reason is democratization of higher education which is becoming available to larger population, therefore it is massive. Trend of democratization of higher education has been present in developed countries for a while, but even they haven't fully adapted yet. Recently this trend has moved to countries in development, above all China and India. At the same time we are witnesses of increasing presence of the knowledge economy, where knowledge and not physical resources, is the main promoter of economic growth. Leading world companies invest at least third of their investment in intangible areas based on knowledge, such as research and development, licensing and marketing. One of the most important promoters of knowledge economy are higher education institutions which provide qualified labor and necessary infrastructure for science –

research activities. We must not forget the significant impact of globalization which not only changes the way of doing business but radically changes the process of education as well. More and more universities are opening departments all over the world; a growing number of countries are trying to turn higher education into export industry. It also changes the nature of the competition. Traditional universities are competing for students and financial funds for research, while private companies are trying to enter the education sector. The World Bank estimates that the total spending on higher education in the world goes up to 300 billion dollars a year or 1% of world economy income [1].

All these changes show that higher education is slowly turning into specific form of industry. Higher education institutions that want to achieve success in new circumstances must start acting similar to profit oriented organizations – they must know their business processes and what is more important, they must know how to improve them, that is, how to manage business performance. The process of performance management includes systematic measurement and evaluation of progress in achieving short-term and long-term goals based on defined critical indicators of performance and use of feedback information about achievements in order to improve performance.

For successful participation in today's competitive markets characterized by hyper-competition, it is very important to harmonize business strategy and the strategy of information technology implementation. Performance management is a methodology that enables achieving and maintaining alignment of these two strategies, but most organizations face great difficulties in trying to implement performance management in a right way.

In Serbia higher education institutions have been mainly social and not profit-oriented organizations for many years, traditionally financed by the state. Securing quality labor, which has economic knowledge and skills for easier and faster development and prosperity of entire society was their main goal. Global changes along with the new national education policy which, among other things, gives more space to private initiative than before,

led to significant changes in the business environment of higher education institutions. The state is decreasing funding from the budget and directs higher education institutions to other sources of funding, such as scholarships and research projects funds. At the same time competition is getting more fierce by introducing profit-oriented and private higher education institutions, which introduce new business rules focused primarily on profit in education segment. All this requires from higher education institutions to pay more attention to quality of educational process, but also to their efficiency and appropriateness.

II. THEORETICAL METHODOLOGICAL AND TECHNICAL TECHNOLOGICAL FUNDAMENTALS OF SYSTEM DEVELOPMENT

Though primarily applied in profit-oriented organizations to achieve better results and survival and prosperity in the market, the concept of business performance management is also applicable in the segment of higher education. In applying the concept of performance management in higher education institutions the specifics of the educational process should be taken into account and the whole concept should be adjusted to them. By applying this concept, organizations achieve better control over the use of resources and quality of results achieved, as well as over directing the organization towards its vision and mission.

Performance management can be described as a series of business activities and applications designed to optimize both the development and implementation of business strategy [2]. Process of performance management includes [3]:

- creating the vision of the desired position in the future;
- planning – evaluation of the current position of organization with reference to its vision, creating strategies in order to achieve desired future position and establish advantages necessary for achieving the vision;
- defining, development and effective implementation of specific improvement plans, which provide reaching desired future positions, especially in segments of achieved performances;
- designing, re-designing, development and implementation of a system for measurement and evaluation, which informs us whether we are going in the right direction and how much we have progressed in our efforts to achieve the objectives;
- establishing of support system within the organizational culture, which promotes and rewards progress, in order to maintain the results achieved and to ensure the control of performance level necessary to cope with new competition.

Performance can simply be understood as an ability of an organisation to achieve its objectives [4]. Necessary conditions of a successful corporate performance are well formed, arranged and adjusted business processes.

Whether and to what extent is organization performance successful, whether and to what extent are its business processes well designed and coordinated, whether and to what extent is their organization structure adapted is evaluated in relation to a set of strategic goals. Organizations without a clear set of strategic goals and a clear strategy don't have the most important basics for evaluation of their business processes and organization structure. Only excellence in modeling and managing performances of business processes leads to organization competitiveness, its retaining existing and getting new clients, optimal managing and maintaining resources, development of intellectual property and continuous development.

Process performance indicates how well the process is performed. The way of conducting processes is reflected negatively or positively on business results. The need for establishing measurable performances is derived from the fact that something can't be managed if it is not measured. Performance measurement can be done in several aspects: quality, expenses, time cycles, amount, productivity, impact on the environment. Measurement of process performance affects the understanding of process, its better control, better delegation of responsibilities, adjustment of business goals, and overview of achievements and recognition of results.

Performance should not be measured just to overview the result. Deming pointed out that by saying that "measurement of productivity does not improve productivity" [5]. Performance measurement should not be carried out for its own sake as the measurement techniques should not be used separately from those used for constant improvement and re-engineering of processes. Performance measurement should be observed only in context of performance management which implies continuous cycle of setting and operationalization of goals, planning, measuring, monitoring, evaluating, giving feedback and improving performances. Necessary conditions for proper performance management are properly developed sets of performance indicators. Performance indicators (PI) are measures which describe whether and how much an organisation and its processes are achieving set goals. Key performance indicators (KPI) are variables which together provide meaningful, concise, and general picture of achieved performance. KPIs reflect the critical success factors and are used for reporting on the progress towards defined goals [6].

Presentation techniques specific to performance management are (a) score cards based on a methodology such as Balanced Scorecard (BSC), which are suitable for gaining insight into the achievement of strategic and tactical objectives and (b) dashboards which are particularly useful in performance monitoring and tracking. BSC methodology provides a mechanism for translating the vision, strategy and goals of organization into a performance measurement system, which contributes to linking long-term goals with short-term actions. Goals are mapped in a set of key performance indicators which are then tracked in those elements which are marked as critical for successful implementation of the strategy and goals achievement .

Performance management simply can't be effective and efficient without appropriate IT support that implies design and implementation of a specific performance management support system. Given the functionality expected from such a system there is no doubt that it should primarily rely on business intelligence technologies and solutions. Purpose and task of such a system is to support users through the entire process of performance management, which means that they are planning, monitoring, measuring, controlling and improving performance using software products with many features and high performance. Although it happens that the term business intelligence is used as a synonym for performance management, it is evident that there is a significant difference between these two terms. Business intelligence provides the tools needed to advance the process of decision making within an organization, but it does not provide a systematic method of planning, monitoring and controlling the activities in order to achieve strategic business goals. Business intelligence is a technological solution that enables organizations to consolidate and manage large amounts of business data in order to support and improve the decision making process. Business intelligence provides IT infrastructure and applications necessary for implementation of performance management. Performance management provides resources and skills for connecting business strategy with the available technologies in order to direct the entire organization towards achieving common organizational goals. Performance management is a process that uses business intelligence tools. Proactive performance management helps organizations to improve their current business operations and processes, while business intelligence reactively makes decisions based on historical data [7]. Although we are faced with two different concepts, the lines that separate them are quite blurred in practice and there are more and more solutions for integration of business intelligence and performance management.

III. ARCHITECTURE SYSTEM FOR MEASUREMENT AND EVALUATION OF PERFORMANCES

The purpose of a performance measurement and evaluation system is to provide continuous observation and monitoring of the activities of the organization and its processes and effects of these activities in order to gain insight into the size and speed of progress toward desired direction. In order to meet this demand system should enable easy and efficient monitoring and analysis of data concerning the planned and actual achievements of the organization / processes in order to identify trouble spots in terms of goals fulfillment. Data on actual achievements are normally recorded in the ERP system of an organization. In the ideal case, the planned values are recorded within the same system, but it is not rare that they are formed and stored separately from the ERP system (electronic tables, specialized applications, etc.) Even in a situation where the planned and actual values can be found in the organization's ERP system it is recommended that they should develop a separate analytical database as a performance measurement and evaluation system data repository [8]. Some advantages of this solution are:

- greater openness to a variety of ERP and other solutions - the differences are bridged by forming interfaces whose task is to transform the original data structures in a form recognizable by the analytical system;
- storage of historical data while retaining the high level of system response.

A necessary condition for achieving the second mentioned advantage is that such an analytic database is designed and implemented in accordance with the recommendations known as data warehouse (DW) principles. The analytical database of the educational process performance measurement and evaluation system can be treated as a data mart (DM) within the corporate data warehouse. The main purpose of forming analytical database is to provide central repository of verified and integrated data which will serve as infrastructural basis for the development of various analytical solutions which support managers in decision-making. Integrity and accuracy of the data is the result of the procedure referred to as ETL, whose task is to extract data from source systems, transform (clean, format, map and restructure) and load the data into the analytical database.

To further underline the first of the mentioned advantages in the development of this analytical system, we have decided to introduce a new data layer between the source (transactional) systems and the analytical database. This intermediate layer, which contains mostly normalized data, has allowed the division of the ETL process into two parts. The first part is the responsibility of the organization in which the system is implemented and is related to the extraction of data from source systems and their format, while the second part is the responsibility of the software supplier and includes cleaning, mapping, restructuring and loading of data (figure 1).

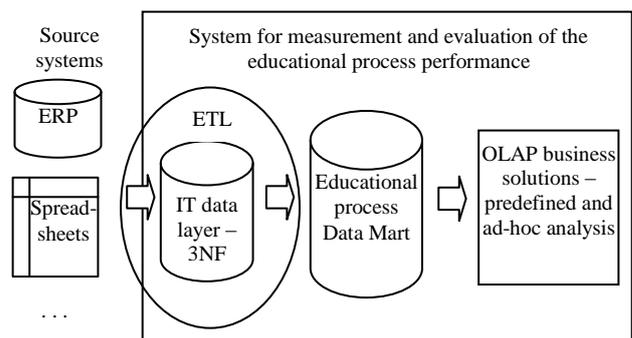


Figure 1. The architecture of the educational process performance measurement and evaluation system

End-user application solutions are developed in an OLAP environment and allow the exercise of predefined and ad-hoc analysis. A great number of predefined tabular and graphical reports, dashboards and scorecards are supplied as standard elements of analytical solution which are immediately available to users. Thanks to the intuitive OLAP environment and wealth of OLAP Data Dictionary, users can redefine existing or define totally new analysis without any difficulties. The performance indicators are implemented as OLAP metrics and by choosing them users can define measures of business that they want to

analyze. By choosing OLAP attributes, the users describe dimensions of business which are the subject of analysis, that is the angles from which they want to observe the data. Specifying data filtering conditions, users select a subset of data used for calculation of the performance indicators values. The comparison of planned and actual values is the basis for the assessment of achievement, which can be effectively visualized by using dashboards and scorecards.

IV. SYSTEM FUNCTIONALITY

When describing the functionality of the system, we could start from a general stance that the process of performance management includes four key phases: defining the strategy, planning, monitoring and analysis, and undertaking corrective actions [2]. Considering this division we can conclude that the purpose of the developed measurement and evaluation system is to support managers in the implementation of the third phase of the process. This phase allows monitoring of the current performance in relation to the desired levels of business metrics. At this stage, one can estimate the performance at the level of an organization, business units and individuals. It also provides users with the ability to research data in order to obtain detailed information upon which they can take an appropriate corrective action.

The functionality of the educational process performance measurement and evaluation system can be viewed from two perspectives. The first is related to facilities that allow users to perform their own analysis (ad-hoc analysis), and the latter highlights predefined analyses that are delivered with the software. These predefined outputs (reports, dashboards, scorecards) are standardized forms that reflect the vision and knowledge of the software supplier in terms of information to be provided to users. Technology underlying the system provides the possibility to design new reports by user, only the level of their creativity determines to what extent they will seize the opportunity of performing the ad-hoc analysis. To enable ad-hoc and predefined analysis, it was necessary to develop a system of performance indicators of the educational process, to define the way in which their value is calculated and implement them as business metrics within the OLAP system. These metrics, along with hierarchical attributes of business dimensions and static and dynamic data filters are the building blocks of reports and other forms of presenting results of data processing. System functionality related to predefined analysis is classified into the following subsystems:

- Students
 - Recruitment of students
 - Student progress
 - Student mobility
 - Ending of studies
- Teaching staff
- Quality of educational process

Subsystem of students focuses on measuring and evaluating the performance of the educational process in terms of students as one of the key resources. Analyses included in this subsystem are divided into several groups.

Measurement and evaluation of student recruitment are related to the analysis of competition for enrollment in the first year in terms of number and characteristics of applicants (the number of candidates, their structure based on the type and location of high school, the average grade achieved in high school, citizenship, and other attributes), their preferences (study programs, entrance exam, language of the entrance exam, the preferred location of study, etc.) and their first enrollment in college (the number of students in relation to the enrollment quotas, the enrollment rate in relation to the number of candidates who have satisfied the conditions, correspondence analysis of the desired and actually entered study programs, etc.). All these analyses can be done from any business perspective, with special emphasis on the perspective of time, which allows the analysis of trends.

Measuring and evaluating the progress of students is related to student enrollment and exam results. In terms of student enrollment, some analyses allow system to consider the analysis of the number of students according various criteria, analysis of the number of students who have enrolled in the following year of study, analysis of the structure of students according to the number of ESP points earned, retention analysis (the number and rate of students who have left studies), analysis of the structure of transfer from other colleges and more.

Figure 2 shows one of the predefined reports related to the analysis of trends in the number of enrolled students based on the type of high school they have graduated from. Values highlighted in green indicate increase, while the values marked in red indicate decrease in the number of students enrolled, compared to the previous school year.

Srednjaškola	SkolskaGodinaUpisa	Metrics	IndeksRastaBrojUpisanihStudenata
Ekonomska škola	2007/2008		1,2793
	2008/2009		2,2280
	2009/2010		1,1283
	2010/2011		0,0382
Gimnazija	2007/2008		1,3253
	2008/2009		2,5979
	2009/2010		0,9307
	2010/2011		0,0248
Gradjevinska škola	2007/2008		1,2401
	2008/2009		2,2653
	2009/2010		1,2330
	2010/2011		0,0218
Medicinska škola	2007/2008		1,2053
	2008/2009		1,8682
	2009/2010		1,5293
	2010/2011		0,0512
Tehnicka škola	2007/2008		1,9322
	2008/2009		1,4342
	2009/2010		1,4924
	2010/2011		0,0318
Turisticka škola	2007/2008		1,2236
	2008/2009		1,9765
	2009/2010		1,2285
	2010/2011		0,0172

Figure 2. The growth index of the number of enrolled students related to previous school year based on the type of high school.

As an illustration of the possibilities of the system we have chosen the analysis of the structure of enrolled students based on the number of ECTS credits earned in the previous school year. Students are grouped into the following categories with respect to the total number of ECTS points: a) 60 - 48 b) 47-37 c) less than 37. The user has the option to choose the school year, the year of study

and the study program he wants to analyze the structure for.

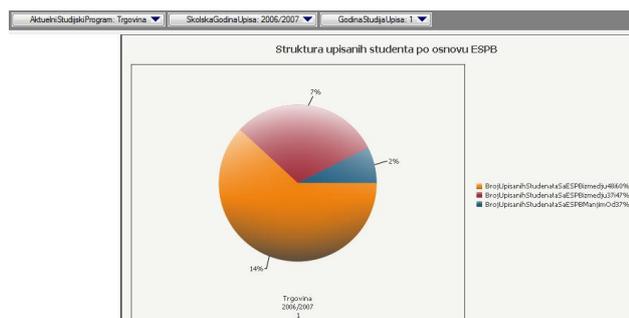


Figure 3. Structure of enrolled students according to the number of ECTS credits earned in the previous school year.

The analysis of performance in terms of success in performing exams is primarily focused on tracking successfully passed exams and average grades achieved with reference to subjects, professors, departments, students and their study programs. The degree of transience is calculated by dividing the number of students who passed the exam in relation to the number of students who chose this subject in a specific school year. Choosing an exam period provides an opportunity to present the effectiveness of performing exams taking into account only the exams passed by that period (cumulatively). The dashboard shown in Figure 4 is used for the analysis of the exam pass rate of the students on some study program. In this particular example a satisfactory pass rate is defined as the one in the range of 50 to 85%. One look is enough to establish which study programs have a satisfactory performance (green zone).

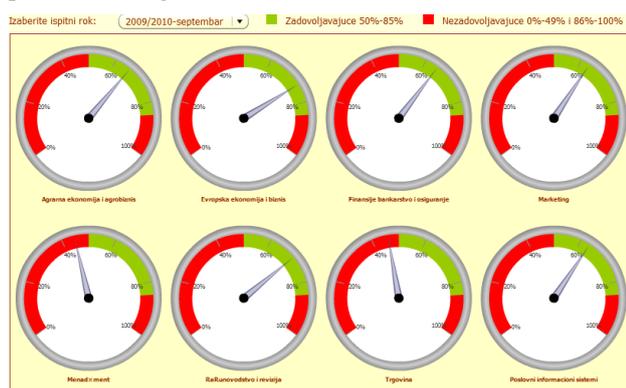


Figure 4. Evaluation of the exam pass rate based on study programs and examination periods.

The subsystem of completing studies enables measurement and valuation of performance of the organization in terms of length and average grade of study, activities of professors as mentors and other analyses.

The subsystem of teaching staff enables the analysis of teaching staff potential and utilisation of that potential, and includes the following analyses:

- Analysis of the number of students per professors / assistants
- Analysis related to the number of professors and assistants

- Analysis of the professors' workload in terms of hours per semester
- Analysis of professors' workload in terms of applicative and theoretical disciplines
- Analysis of the professional development of professors and assistants abroad
- Analysis of the development of the system relating to the process of teaching staff motivation.

The subsystem of quality of the educational process is primarily intended to cover the analysis of professionalism of staff and competence of students, and includes the following reviews:

- Evaluation of the quality of professors' lecturing and examination, done by students
- Evaluation of the quality of assistants' teaching and examination, done by students
- Evaluation of the percentage of students who regularly attend classes (by subject)
- Evaluation of elective subjects re-selection
- Evaluation of the quality of literature and teaching aids
- Evaluation of the quality and usefulness of study programs by employees and active employed graduated students
- Evaluation of expertise and knowledge of the staff and the active employed graduated students by their employers
- Evaluation of the number of students per classrooms/IT laboratories
- Evaluation of communication between professor and student services, and students
- Analysis of extracurricular activities

V. CONCLUSION

Fundamental changes have gradually transformed higher education into a specific type of industry and higher education institutions that want to succeed in the new circumstances must recognize and improve their business processes, and manage their business performance. Although it has been primarily applied in profit-oriented enterprises, the concept of performance management is applicable in the segment of higher education as well.

Performance management includes a range of integrated operational and analytical processes that perform two interrelated tasks: participation in defining strategic goals and support in the realization of the strategic objectives defined in order to achieve the desired performance. Strategic objectives are developed by determining the specific objectives and key performance indicators specific for a given organization. Specific goals and indicators are then aligned with operational metrics and connected with incentives for achieving higher performance, ensuring effective implementation of the strategy throughout the organization.

Efficient and effective performance management is impossible without adequate IT/IS support. This paper presents the architecture and the functionality of a system

which has been developed with the purpose of measuring and assessing the educational process performance in higher education institutions. This system provides substantial support to managers in monitoring and evaluating the effectiveness of carrying out the educational process as a key process in higher education institutions.

From the theoretical and methodological standpoint, the system is based on the Balanced Scorecard methodology, which is widely accepted in the management concept which partly supports this system. The system relies on various IT technologies with special focus on business intelligence technologies and systems. End-user applications have been developed in ROLAP environment and are accessible through the Web (WOLAP). The development of the system required the design and implementation of: a) analytical data repository, b) procedures for its charging, c) system of performance indicators and d) user application solutions. Predefined performance indicators are implemented in OLAP environment as business metrics. These metrics, together with the attributes of business dimensions, are system objects that allow users to perform ad-hoc analysis. Dozens of predefined reports (tabular or graphic), dashboards and scorecards are an integral part of the system. The system manages the space provided for storing data, but the data itself must be provided by the organization which wants to implement this system. Usefulness of the information provided by the system depends largely on the quantity and quality of the available data that can be collected from the source

systems. Even if it is estimated that the available data are scarce, there are good reasons for implementing this system. Its implementation will show the white holes in the available data, which is likely to encourage activities aimed at their elimination and improvement of the source systems.

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Extraction of a Thesaurus and a Project Structure from Open-source Software GIT Repository

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Abstract – The paper deals with the problem of automatic extraction of a project structure and its ontology from revision control system's commit network. The problem is solved on the base of logical analysis of project branching structure and grouping the branches according to the ontology. The aim of the research is to investigate a possibility to describe the project structure in ontology terms of the project domain.

I. INTRODUCTION

The evolution of instrumental software is aimed at shifting the programmer's creative activity to the higher level of abstraction. The programming technologies like UML, CASE, MDA (Model Driven Architecture) allow programmer to consider (to model) the software systems under development on the higher level of abstraction as compared to the source code of subsystems; all of them usually generate parts of the source code from their abstract models. Ontological models are abstract models which basically denote the terminological basis and special entity sets of project domain and the developed software. The ontological models reflect a set of terms used by programmers to describe software artifacts, various technical documentation and other texts related to the software. We consider a problem of ontology models construction and use them in development automation within the software life cycle.

The ontology model (hereafter "ontology") can be

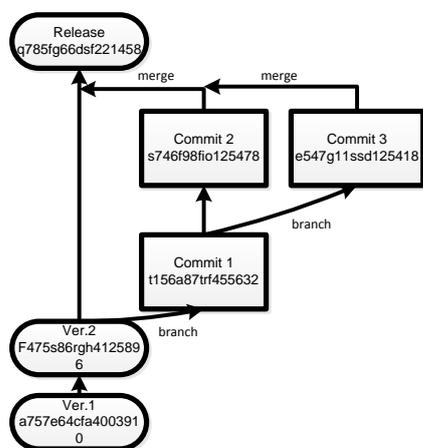


Figure 1. An example diagram of a GIT-network

extracted from the texts as thesaurus [1] and be further developed in the life cycle of the software. From other hand side the ontology modification sometimes implies also the software modifications, thus, the ontology affects in some degree the software development process. To support the statement we try to construct a thesaurus used in various text messages related to open-source software project, accounting branching structure of the project. The branching structure is extracted from GIT commit network (repository) of the project source code. Hierarchical structure of ontology could in some extend correlate with project structure. Under *project structure* we consider tree-like representation of the project branching structure; the tree reflects hierarchical division of the project to inferior subprojects.

The source information for the investigation is a network graph structure representing all development, branching, and merging modes of the project sources stored in its GIT repository (see fig. 1). The network reflects a time line of the project development process. Each new branching node can be interpreted as starting or continuation point of a subproject, but many of the branches are devoted to fixing errors. Merge points can be interpreted as finishing or committing points of a subproject. So the analysis of the commit network is, in general, a pattern recognition problem under control of heuristics. In our case the heuristics are defined as mutual relevance of branches.

II. THE PROJECT STRUCTURE ANALYSIS

In order to compare the thesaurus and the project structure, a tree of project structure should be extracted from GIT-network of open-source project source code. GIT is a distributed version control system developed by Linus Torvalds pecially to manage the development of the Linux kernel as very complex project [2]. GIT supports rapid split and merge versions of the source code, includes tools for visualization and navigation. GIT also supports each developer a local copy of the entire history of the development. The changes that made locally can be propagated from one repository to another by various ways. In addition, this system allows representing the history of the changes (the network) graphically.

Nodes of GIT network are versions of the source code and are identified by the SHA1-hashed strings and accompanied with commit messages. Every commit is a fixation of changes made in a working copy of the main repository of the project, as well as a description of the

changes. In the graph representation the nodes are connected to each other, each combination of the connections form either linear intervals of the development either splitting (branching) subprojects or merging of the subprojects or their results in a superior subproject.

The branching and merging in GIT can appear as results of two different kind of programmer's activity. The first activity is cloning a repository, e.g., creating local copy of the main project repository and incorporating the changes made in the main repository. The second case, which is of our interest, is the project development itself. In this case according to developer recommendation of GIT programmer should create a lightweight branch of the repository, develop the feature or correct an error, and then merge results to a superior branch, in particular in the main branch. The simplified graphical representation of the software development served by GIT is given in Fig. 1. In the essence the merged results cloning and modifications are the usual case of branch formation.

Besides branching and merging nodes the development timeline contains linear intervals. Linear intervals reflect most probably a logical sequence of the development events related to the same subproject. The same is true for a sequence of merging events coming from an auxiliary subproject branch. Branching most frequently denote creation of a subproject.

To recognize branches in GIT-network an analytical program is being developed in the programming environment XSB [3]. XSB is chosen due to its powerful ability to index dynamic facts on their arguments. The idea is to develop a set of Prolog rules which will recognize template subgraphs and construct markup structure denoting for each node its role and inclusion. The source data for the analysis is a set of Prolog facts about GIT-network obtained by means of translation of the network structure.

A. Recognition of basic structures

The translation subsystem is developed using the programming language Python, as well as its libraries GitPython. GitPython is a Python library used to interact with GIT repositories at various levels of abstraction. GitPython provides object model access to a GIT repository. It allows traverse the repository to find parent commits, trees, source code objects, binary blobs, etc. It provides abstractions of GIT objects for easy access of repository data.

The translation subsystem transforms the structure of

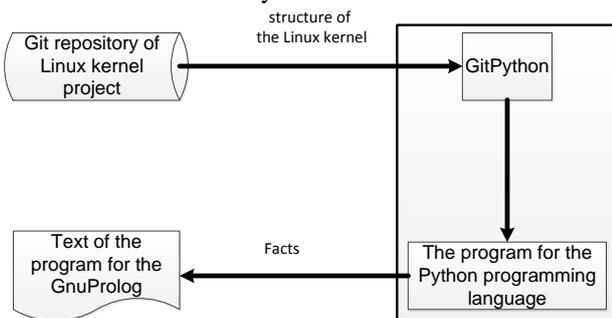


Figure 2. Extraction node information from GIT repository

the project represented in a GIT repository into a text format, which can be loaded by XSB predicates `consult/1` or `load_dyn/2`, i.e., into a collection of facts (fig. 2). The facts in this case are the SHA1-hashed commits identifiers. The facts establish parent-child relationship between nodes. The versions in a GIT repository can be marked with tags, which are labels assigned to a specific commit of the source code. The tag label as a compound string value can express a symbolic name for a group of committed files, and a common version of each file in the group in some general versioning principle. This property of tags gives us a possibility to consider the inheritance of the individual parts of the project, and different versions of the project as well.

The following prolog sentences are examples of a GIT-network translation:

```
node('df145gt6984tgh1254fr').
node('4684dsf457fesae4452').
node('qw78er96ty54uil2opo').
node('as558df74g110hyu058').
parent('df145gt6984tgh1254fr',
'4684dsf457fesae4452').
parent('df145gt6984tgh1254fr',
'qw78er96ty54uil2opo').
parent('4684dsf457fesae4452',
'as558df74g110hyu058').
parent('qw78er96ty54uil2opo',
'as558df74g110hyu058').
```

These phrases are basic structure recognition rules.

```
branch(Z,X,Y):-
parent(Z,X),parent(Z,Y),X\=Z.
merge(X,Y,Z):-
parent(X,Z),parent(Y,Z),X\=Z.
tag('v3.3-rc2','4564dfgert84tdre4gs').
recent('v3.3-rc2','v3.3-rc1').
tagged(T,R):-tag(T,R),!.
tagged(T,R):-parent(P,R),tagged(T,P).
```

The facts of the structure `node/1` denote existence of the nodes in the GIT network. Facts `parent/2` denote inheritance relation between existing nodes. Facts `tag/2` associates a tag value with a node, and `recent/2` defines a versioning order between tags. Rules `branch/3` and `merge/3` are base rules for recognition of branching and merging; rule `tagged/2` reveals whether a node belongs to a tagged set of commits. In order to extract the project structure it is necessary to run all recognition rules and write down all combinations of variable values obtained as a result of Prolog's logical inference.

The following prolog rules recognize linear development intervals of nodes.

```
merged(X,Y):-
merge(X,_,Y),!.
nbr(X):-
branch(_,_,X),!,fail.
nbr(X):-
merge(_,_,X),!,fail.
nbr(_).
strict(X,X,K,K,1):-
nbr(X).
strict(X,Y,K,[Z|T],N):-
```

```

nbr(X),
parent(Z,X),
strict(Z,Y, K, T, M),
N is M+1.
/*      Recognition of chains.*/
/*      -//- between branch & merge.*/
chain(X,Y, [X,Z|T], N):-
    branch(Z,_X),
    \+ foundchain(Z,_,_,_),
    strict(Z,R,[Y],T,N),
    merge(R,_Y),
    cache(foundchain(Z,X,Y,N)).
chain(X,Y, [X,Y], 0):-
    branch(Y,_X),
    \+ foundchain(Y,_,_,_),
    merge(X,_Y),
    cache(foundchain(Y,X,Y,0)).
/*      -//- between merge & branch.*/
chain(X,Y, [X,Z|T], N):-
    merge(Z,_X),
    \+ foundchain(Z,_,_,_),
    strict(Z,R,[Y],T,N),
    branch(R,_Y),
    cache(foundchain(Z,X,Y,N)).
chain(X,Y, [X,Y], 0):-
    merge(Y,_X),
    \+ foundchain(Y,_,_,_),
    branch(X,_Y),
    cache(foundchain(Y,X,Y,0)).

```

Predicate chain/4 defines relation between a starting node, an ending node, a path and the length of the path. A path is, e.g., a linear piece of GIT network, which starts from branching, ends at merging, has no branching and merging inside. Predicate nbr/1 denotes the argument is neither branching, nor merging node; strict/5 recognizes linear subpath inside branch under recognition. Predicate (dynamic fact) foundchain/4 stores the result of the recognition. Its arguments are start node, end node, path identifier, and path length. The path identifier is a node inside path, which distinct the path between various paths having common branching and merging nodes and the same length. Length is used to debug algorithms: we filter program output with command line grep utility and calculate statistics by number of processed branches according to their lengths. Auxiliary predicate cache/1 stores dynamic fact foundchain/4 in working memory and shows the progress of recognition.

III. THESAURUS EXTRACTION

After branching structure has been deduced from GIT network, the nodes of the structure should be labeled by terms. The labeling denotes names of subprojects and their purposes, as well as project-subproject relationships (fig 3.). The labeling terms are obtained from texts associated with commit messages of GIT network nodes. In this section we consider an approach, which used to construct a thesaurus and labeling from commit messages. The thesaurus extraction approach is based on technique described in [4].

Thesaurus is a way of formalizing object domains of software under development, it is kind of ontology. Ontology is an object domain model consisting of a set of concepts and a set of assertions about these concepts, based on which classes, relations, functions and individuals can be described. Ontologies are intuitively used by programmers to refer objects and their relationships to be implemented. Hypothetically, using of ontologies allows automating the development some parts of information models.

A. A general scheme of thesaurus construction

On the first step a set of independent texts are prepared. The texts are stored in fast access database. After that full text index of the stemmed words (hereafter terms) of the texts is produced. The index should contain forth and back references between terms and texts.

On the second step the terminological basis construction algorithm looks through the texts and tries to join adjacent terms found in texts in a compound term. The full text index frequency for the compound term is figured out. The join succeeds if the frequency of the term decreases not more than in 0.7 times (the coefficient is arbitrary and subject of experiments). If an original single term is used at least once as first word of a compound term, then it is removed from the terminological basis.

On the next step full text index is transformed into terminological index, where the terms are mapped into their frequencies of appearances in the texts. Now the texts are represented as points in property space, where each of the property is a term of the terminological basis. If term appearances frequencies are similar for two texts then the texts are similar and located near to each other in the property space. The set of texts are processed by some hierarchical clustering algorithm, which induced the hierarchy of classes of semantically similar texts. We use agglomerative clustering methods as it has lower computation complexity with comparison to divisive methods.

On the last step in each join node of cluster the terminological index is recalculated for the texts belonging to the node. The most frequent term is selected among the terms appeared in the texts. This term denotes the semantic of the node. Also among most frequent terms a set of terms can be chosen, the set will also describe the semantic of the texts. The resulting hierarchy clustering also denotes class-subclass (term-subterm) relationship between terms as required by thesaurus.

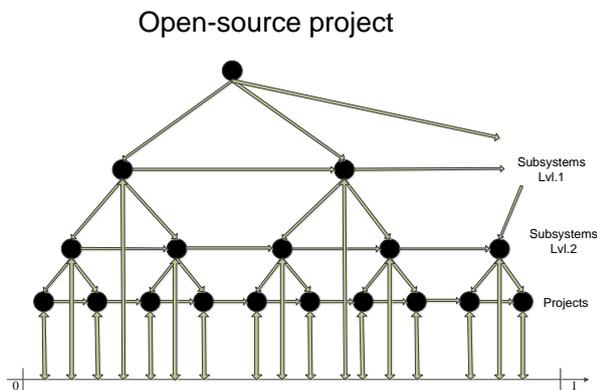


Figure 3. Extraction node information from GIT repository

B. Implementation of the scheme

The set of independent texts are constructed from joined together commit messages from one recognized branch. It is supposed that all programmer's work in a branch devoted to one problem.

The joined commits stored in a MySQL MySAM table. The stemmed word index is generated by means of slightly modified Sphinx search engine (<http://www.sphinxsearch.com>). Sphinx is an open source full text search tool, designed from the ground up with performance, relevance (i.e., search quality), and integration simplicity in mind. It lets programmer index and search data stored in an SQL database or in other storages. Sphinx also supports database server interface and a MySQL embedded mode. Our modifications allow relating engine's CRC32-coding of the stemmed words with the original worlds; originally the engine does not store this relation. Also we made some API modifications to unload the index in a Python language dictionary-like structure.

A terminological basis is induced by a Python script according to the above described scheme using a library `hcluster` for the hierarchical cluster construction. The main role of the Python program is to calculate indexes for the subsets and convert data structures before and after processing with the external library modules.

IV. CONCLUSION

In this paper we considered software for a project structure analysis of a software project revision control system commit network. An open-source project and its GIT-network are used as testing ground. The GIT-network is essentially represented as 2-D structure, where the first dimension is a structural location of a subproject, the second dimension is a time moments of the commits of each of subproject. Logic recognition procedures have been developed and implemented as Prolog program to recognize the space coordinate of each commit. Procedures for ontology extraction and labeling the project tree from the commit messages have been implemented.

In the essence we are interested in investigation of the possibility to describe the software development process in terms of ontological model and source code representation, i.e., some kind of functional relations

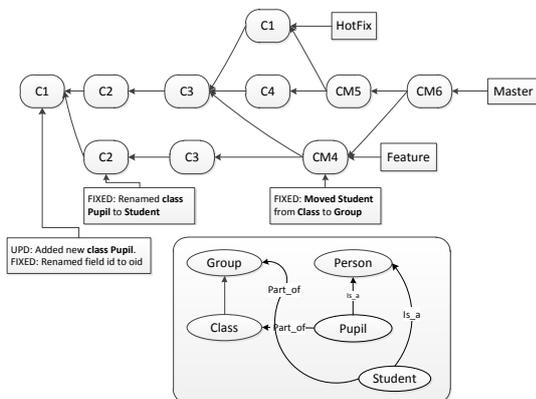


Figure 4. Ontology terms are the semantic basis of commit messages

between structures. From other hand side the source code change commit messages describe the ontology change (fig. 4): some messages can be interpreted in constructive fashion by means of description of the source code changes.

Test investigations of the developed software were conducted on three independent open-source projects taken from github.com. The structures of these projects have been converted to the lists of facts in Prolog, and, using the recognition rules, we separated the linear section of the development process of each project. Unfortunately, we were unable to label branches with terms extracted from developers' commit messages. The obtained terms were irrelevant to programming terms at all. Experiments with filtering terms by frequencies have also failed. At first glance it seems that the problem occurs because the messages contain mostly references (links) to external messages on development boards (forums, bug lists, tickets, etc.), and the rest of texts was only action made by programmers (e.g. "Fixed bug #2343"). To solve this problem we need to analyze messages that are referenced by the commits. In addition, it would be of purpose to extract programmers' slang vocabulary firstly from the terminological basis.

In the same time by means of the hierarchy clustering we managed to recognize adjacent branches dealing with a common problem, most of them are located near by the time line. This inspires us to proceed with the experiments further. The structure recognition and thesaurus construction can be improved if some tagging information of the messages, such as fields 'FIX:', 'TODO:' is used and analyzed.

The results of the investigations supposed to be used as an advisory or a project planning subsystem in a new generation of designers' instrumental software. For example, having modified a formalized ontology, the instrumental software could suggest a modification of an UML Class Diagram or advice designers to implement new software function on the base of the new feature textual description analysis [5].

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SLAP Project Pipeline of Municipal Infrastructure Project in Serbia

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Abstract – As Serbia becomes the Candidate country to EU integration, the IPA III component (regional development) funds will be available. To increase absorption capacity, it is necessary to get updated, valid data on project’s maturity which SLAP IS presents. (readiness for financing, respecting national and EU regulations). In the paper SLAP information system (“project pipeline” of municipal infrastructure projects) is presenting: the needs, the methodology, the result

I. INTRODUCTION

The money transfer from EU funds toward member states, candidate countries and potential member states significantly affects to the country beneficiary economy. In the last years, in order to EU funds efficiency allocation improving, based on the EU regulations, stronger efforts have been made to absorption capacity of the country beneficiary, attention.

The Stabilization and Association Agreement (SAA) is an international treaty, signed on 29 April 2008 between the Republic of Serbia and the European Union. The 10 billions of Euro, the budget of European Union for the period 2007-2013 defined as IPA (Instrument for Pre Accession) was setup with overall objective to increase candidate countries and potential member states institutions’ capacities for EU structural funds usage, once they become EU member states. IPA has substitutes all previous supporting instruments to the candidate countries and pre-candidate countries. IPA has consists of five specialized components: 1) support for transition and institution-building, 2) cross-border cooperation, 3) regional development, 4) human resources development, 5) rural development. Before getting status of the candidate country, Serbia will have access to the first two components, only.

The legislative basis of IPA:

- IPA Framework Regulation (Regulation (EC) No 1085/2006)
- IPA Implementing Regulation (Regulation (EC) No 718/2007)
- IPA . Framework Agreement
- IPA Financing Agreement
- PRAG (Practical Guide to Contract Procedures for external actions financed by the EC)

IPA is based on the same principles as EU structural funds, dedicated to the transition reform processes support, institutional capacities upgrade for its usage, and

absorption capacity increasing of EU structural funds usage.

Similarities between IPA and structural/cohesion funds are:

- readiness and capability to fund’s management independently and decentralized,
- necessity of nominate institutions for funds’ management
- the system of multiyear programming and implementation setup consisting of several phases including priorities identification, financing and the system of managing and control
- good financial fund’s management and obligatory co-financing
- programme’s implementation based on the territorial level (NUTS classification¹)

Conclusions:

The programming is the basic precondition of allocation of financial sources from IPA funds. It is necessary to active work on the preparation of local politics from which the projects can be defined, and can be aligned with wither sector, thematic and territorial programme. This type of basic preparedness will be more important, for the period after 2014. year increasing the money dedicated to programmes leads toward EU integration, is expecting (IPA – 11,2 billions of Euros, after 2014. – 14,4 billions of Euros). The candidate status of the Republic of Serbia, will not lead to the increase of the approved IPA funds, but will contribute to it’s distribution. In this moment, IPA funds are using in the scope of only first two components. The main change will be the method of project preparation. The main number of projects of local infrastructure, should be financed from the IPA III component (Regional development). In order to use those funds, in the scope of this component Strategic framework and Operational Programme have to be prepared. For this purpose

¹ „*region*“ is a statistical functional territorial unit, consists of one or more areas, established for the purpose of planning and realization of the regional development policy, in line with nomenclature of territorial statistical units on the Level II, and is not an administrative territorial unit and doesn’t present a legal entity“ – The Low on Regional Development of the Republic of Serbia, article 4

information on project preparedness (project maturity) have to be available.

Considering documents: European Partnership, Multi-annual Indicative Planning Document (MIPD), Multi-annual Indicative Financial Framework (MIFF), the document “ Strategic Coherence Framework (SCF)” is being made. This is three years document covering: thematic priorities in the scope of IPA components III and IV, identification of thematic areas where Serbia intends to concentrate resources, description of the goals, the list of programmes, and budget framework for programme’s implementation. On the basis of SCF, Operational Programmes (OP) are preparing. The number of OPs created depends on the State’s decision, but have to cover regional competitiveness, environment, traffic and human resource development. OPs consists of: midterm goals and needs assessment, selected priorities description, financial assessments per each year, the structure for it’s implementation identification, regulated in the EU Official Gazette EU 1260/99.

The experiences from the new EU Member States indicates that in the many of them, exists significant limitations and obstacles related to absorption capacities² and effectiveness of EU funds, especially on the local level. From it’s experiences three crucial level of absorption capacity level, exists:

- a. the capacities of local stakeholders for planning
- b. the capacities for projects preparation (the project way of thinking and work in the institutions)
- c. the capacity for acting in partnership

In our country, detailed analyses of EU funds’ influence on regional development have not been prepared, yet. There is only overview of up to now, realized project on the web site ISDACON, information system for coordination of development support to the Republic of Serbia: www.evropa.gov.rs

From the mentioned method of programming IPA funds in Serbia follows:

1. this is parallel, iterative process: “top-to-bottom” and “bottom-to-top”
2. information from direction “top-to-bottom” are in the national (regional) sector strategies (i.e. strategic documents)

² “Absorption (absorptive) capacity” – the term usually presents possibility of the country or the organization to accept help (support) and to use it rationally (i.e. in accordance with real, relevant needs and demands). The term “EU absorption capacity” presents possibility (capacity) EU to integrate or “to absorption” new county-members. Source: http://www.2007-2013.eu/glossary_A.php

3. information from direction “bottom-to-top” are in the local (municipal) strategic documents and projects
4. if the term: *the project* can be defined as achievement in which human, material and financial resources organized on the new innovative way (via: specific scope of the activities, present specifications, fulfillment of the precise time frame, following costs limitations, following standard life cycle) in order to reach positive change defined on the basis quantitative and qualitative goals, then it is obvious that by the project the strategic goals defined in the strategic documents (national, regional and local) can be achieved.
5. absorption capacities of the institutions for IPA funds increases if the possibility to update of data on project in OP, increases.
6. Interested stakeholders in the process of IPA programming comes from the different levels of governance: national, municipal (regional)

Conclusion:

In Serbia is still missing updated, accurate data on projects (national, regional and local) by which strategic goals defined in the strategic documents, achieves. This information contributes to the increasing of efficiency and effectiveness of IPA programming, up to now, collects on yearly basis, mostly by sending to the stakeholders questionnaires via e-mail, or even hard copy by regular mail.

Up to now, in Serbia besides SLAP information system, doesn’t exist unique national data base on projects, with possibility of permanent update.

For the preparation of OP as well as MIPD and MIFF, accurate information on projects’ maturity level are need (the term form English language: “Project pipeline”)

II. POSSIBLE SOLUTION OF THE PROBLEM: SLAP INFORMATION SYSTEM (AN ON-LINE PROJECT PIPELINE)

SLAP (System of Long listed Advanced infrastructure Projects) was created in the scope of Municipal Infrastructure Agency Support Programme (MIASP) in 2007 (as a desk-top software application). The software was delivered to the Standing Conference of Towns and Municipalities on annual Conference commencing December 2007, where it is located up to now. Starting from January the 9th 2012 new version of SLAP on line software was implemented sector oriented toward IPA III components OP preparation. In the cooperation with the Ministry for energy, development and environmental protection of the Government of Serbia, data structure (questionnaires) was implemented into SLAP on line web software application for the following sectors:

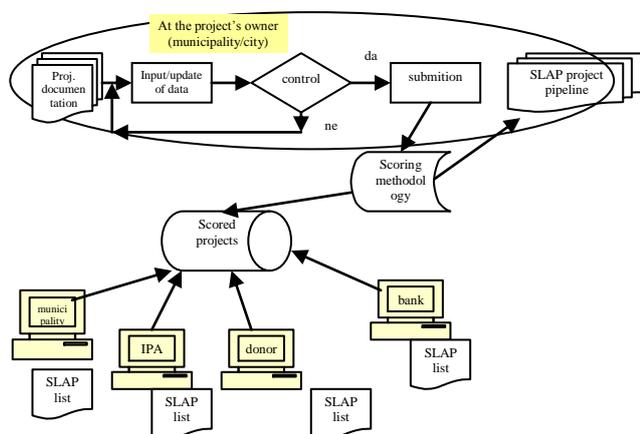
- 1.) Communal solid waste
- 2.) Waste water

- 3.) Remediation
- 4.) Water supply - in the cooperation with technical support of MISP programme and Directorate for Water. (MISP – Municipal Infrastructure Support Programme (www.misp-serbia.rs) an EU programme with the main goal to support development of municipal infrastructure by two aspects: project identification (preparation using SLAP IS) and project implementation, following EU regulations for Structural and Cohesion funds (i.e. IPA III component)

Starting from September the 12th 2012 three sectors from the area of “Economic infrastructure” was implemented into SLAP IS:

- 1) Industrial zones including technological parks
- 2) Business incubators
- 3) Tourism

Data structure (i.e. questionnaire into SLAP on-line data base) was created with cooperation with the Ministry for economy (Department for IPA programming)



PICTURE 1: SLAP (THE METHODOLOGY)

After SLAP coordinator (the employee of the municipality administration, officially appoint by mayor to edit data into SLAP) have finished data entry, he submits it, then the scoring methodology will be automatically implemented into data, and project pipeline (with score) is possible to get from the system. The scoring methodology has been created by the mentioned specialist at the ministries, with the aim to pre-select projects. It is possible to create more than one scoring methodology and create “project pipeline”. The following five attributes of the input data of the projects into SLAP is being scored: Environmental, Financial, Socio-economic, Technical, Institutional. It is, also possible to present evaluation (score) for the project maturity (i.e. preparedness of the project documentation in accordance with the national legislative as well as with EU rules for the IPA funds)

The SLAP project pipeline (with the scores for the mentioned five criteria) is given on the following table (as an output) from SLAP IS:



SLAP Project Scoring Report						Envir	Finan	Socio	Techn	Instit	Total
Municipal Solid Waste	CRITERIA					omn	cial	Econo	ical	ution	
	Project code	Project title	Project location	Beneficiary municipalities/ci	INVEST VALUE (mil.)	Total	Total	Total	Total	Total	
MW-0007-L03-02	Regional sanitary landfill Duboko	Užice	grad Užice	19.08	14	13	9	11	9	56	
MW-0016-L03-02	Regional waste management system	Subotica	grad Subotica и општине Војводина	31.67	13	11	7	11	11	53	
MW-0055-L03-01	Regional centre for solid waste	Novi sad	Novi Sad, Бачка Паланка, Мун. Срем Карловци	4.80	15	6	5	15	11	52	
MW-0058-L03-01	Waste management in West Bačka district	Sombor	Сомбор, Апатин, Оуаци, Мун. Бачка Паланка	15.50	13	3	7	15	13	51	
MW-0057-L03-01	Regional Center for waste management	Niš, Niš	Grad Niš, Opština Ražanj, Opština Zrenjanin	23.55	14	3	5	11	15	48	
MW-0015-L03-02	Regional landfill Zrenjanin	Zrenjanin	Opština Zrenjanin	21.00	14	2	6	15	9	46	
MW-0003-L01-01	Regional Landfill Halovo	Boljevac	Boljevac, Bor	14.68	9	9	10	9	8	45	
MW-0006-L01-01	Regional solid waste	Valjevo	Valjevo, Уб, Лазаревац, Липовац	20.00	14	9	2	10	9	44	

TABLE 1: SLAP PROJEC PIPELINE WITH SCORES (Sector: Municipal Solid Waste)

The recommendations for further development (research):

- 1.) since SLAP project pipeline is based on the data input, data has to be controlled (this function provides, at the moment, SLAP office setup in the SCTM)
- 2.) implement obligatory for data entry/update in the municipalities organizational structure (the draft of SLAP data collection was prepared by SCTM/SLAP office) / in the future period (year) will try to implement into several municipal/cities organizational structure
- 3.) to ensure link the projects with the measures from the national (regional, municipal) strategies (for this purpose, it is recommend to continue cooperation SLAP manager setup with experts from the Serbian Business Registers Agency (SBRA) (in Serbian: “Agencija za privredne registre”) on the basis of the setup of the Regional Development Measures and Incentives, setup in 2012. year)

III. CONCLUSION

SLAP IS presents, up to now, in Serbia the only possible source of data (data base) of municipal infrastructure projects (project pipeline). The main effort, so far has been focused to ensure following principles of it’s design:

- flexibility (possibility to change data fields / sector questionnaire), and possibility to create more than one scoring methodology,
- input of data on the place where data’s source is (i.e. where the project documents is and has been designed - in the municipalities)
- “bottom-to-up” approach

- Increase capacities in the municipalities for IPA funds absorption capacity

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Organizational Communication as a Component of Organizational Intelligence

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Abstract – Organizational intelligence reflects the intellectual ability of an organization which integrates its human and technical (informational and communicational) potentials that are used in solving concrete organizational problems. Critical components of organizational intelligence are: organizational learning, organizational memory, organizational knowledge, organizational conclusion and organizational communication. The aim of this paper, after determining the concept of organizational intelligence, is to identify organizational communication as one of its crucial components.

I. INTRODUCTION

Contemporary organizations are faced with rapidly changeable events in economical, technological, social, cultural, and political environment. Successful reacting of organizations in a very dynamic and, very often, inimical trade ambience, depends on their ability to provide relevant information and to find, at the same time, adequate solutions to the problems they are faced with.

In that sense, the attention of organizational theoreticians and practitioners is focused, on one hand, on designing of the so-called “intellectual” abilities of an organization (organizational learning, communication and organizational memory) and, on the other hand, on incorporating informational and communicational technologies into organizational theory. As a result of these trends, a relatively new concept in organizational theory has developed – the concept of organizational intelligence [7].

II. THE CONCEPT OF ORGANIZATIONAL INTELLIGENCE

As a concept, organizational intelligence has an important place in organizational and management science. It is defined as “intellectual ability of an organization to solve organizational problems” [12]. The focus is on integration of human and technical abilities for solving problems. Precisely, organizational intelligence includes totality of information, experience, knowledge and understanding of organizational problems. It referred to “the capacity of an organization to mobilize all of its available brain power, and to focus that brain power on

achieving its mission” [6].

Technical intelligence represents organizational ability for computer information and knowledge processing. As such, it has a great importance in the transactions of contemporary organizations. On the other hand, human intelligence, or the intelligence of the people employed in the organization, is considered even more important than technical intelligence. Shoshana Zuboff, for instance, says that successful use of informational technology depends, firstly, on human intellect, that is, human “intellectual” skills. These are the skills of: concise thinking, inductive discernment, and theoretical caution [4].

Organizational intelligence can be observed in two different aspects: organizational intelligence as a process and organizational intelligence as the result of that process or the corresponding state [12].

Organizational intelligence as a process, represents an interactive, aggregated, and coordinated complex of human and technical intelligence inside an organization. The interactive dimension of organizational intelligence indicates the relationship between human, between human and technical, as well as between sole technical components of organization. Aggregation of intelligence takes place hierarchically and includes the knowledge on individual, group, and organizational level. Coordination, as the third dimension of organizational intelligence as a process, is of central importance in respect to its manifestation through both its previous dimensions (the process of interaction and the process of aggregation).

Organizational intelligence as a process involves five basic components or parts. These are [11]:

- Organizational memory,
- Organizational knowledge,
- Organizational learning,
- Organizational conclusion, and
- Organizational communication.

Organizational memory represents the ability to store events, situations, successful and unsuccessful behavior as well as the ability to recollect them if necessary. Organizational knowledge involves organizational ability of perception and understanding, which allows the organization to concentrate on the essence. Organizational

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learning represents the ability to promptly use the knowledge stored in the organizational memory and to learn on the basis of experience gained in the past. Learning is reflected in the behavior in non-standard situations and in examining new ways of action. Organizational conclusion involves avoiding, overcoming, and solving problems. Organizational communication includes the total exchange of data, information, and knowledge between and inside human and technical agents in the organization. As an important part of organizational intelligence, organizational communication will be further analyzed in the following sub-headings.

Organizational intelligence, as the result of organizational intelligence as a process, reflects the totality of structured, synthesized, aim-directed pieces of information. It is generated in the situations when there is the need for strengthening the abilities of informational systems used for solving appropriate organizational problems.

III. ORGANIZATIONAL COMMUNICATION

A. *The nature and importance of organizational communication*

Although it is considered as one of the central themes of the organizational and management science, organizational communication is one of those categories for which there is not yet a single, universally accepted definition. Among other things, it has been contributed by the fact that the organizational communication, perhaps more than any other aspect of organizational and management theory and practice, has been subject to dramatic change [8]. Thus, for example, communication is defined as: giving or exchanging of information, ideas and feelings [5]; personal process that involves the exchange of behavior [3]; the process of effective exchange of information and ideas [13].

Communication is also defined as the “glue” that holds the organization as a whole. The organization could not exist if the different members of the organization do not communicate with each other or fail to communicate with people outside the organization. Peter F. Drucker points out the following characteristics of communications: communication is a perception, communication is an expectation, communication sets the appropriate requirements [10].

According to Drucker, the basic condition for the existence of communication is that there is a receiver of information. The person who are sending the information (sender) can not communicate alone. If there is no anyone who listens and receives the information, there will be no communication. The sender is only one of the participants in the communication process, which allows to the recipient to perceive the information.

The perception is a matter of experience. This means that we always perceive configuration, or a whole context that is associated with the received information. In other words, the information, by itself, does not mean anything if the recipient of the information is not able to correlate it to an event or to a situation. Each piece of information is, therefore, a part of a larger picture.

Communication is also the expectation. We perceive what we expect to perceive. Basically, we see clearly what we expect to see. Likewise, when we are listening, we are paying attention to what we expect to hear. Drucker notes that what is not expected will not be received by recipients in a satisfactory manner. In that sense, for successful communication, Drucker recommends to sender to learn about what information the recipients want to hear or see.

Communication always sets some requirements, or manifests any desire or intention. It is almost always associated with motivation. That means if the content of the communication is in accordance with the aspirations, motives, values and goals of the recipient, the communication will produce the desired effects. Otherwise, the information will not be fully accepted.

Kathryn A. Baker believes that the organizational communication is increasingly important to overall organizational functioning. Among other things, it is because: work is more complex and requires greater coordination and interaction among workers; the pace of work is faster; workers are more distributed; simultaneous, distributed work processes are more common, knowledge and innovation are more critical to an organization's competitive advantage; communication technologies and networks are increasingly essential to an organization's structure and strategy [8].

The importance of organizational communication for organization and its functioning can be analyzed through the different types of organizational communication. Heterogeneity of the types of communication in the organization is the result of the different approaches to the phenomenon of communication. Thus, for example, communications can be analyzed: from the aspects of communications' directions (horizontal, vertical, diagonal), in terms of forms of communication (formal and informal), in terms of the content of the communication channels, in terms of styles of communication (verbal, written, non-verbal) and so on.

Direction of communication is one of the approaches for analyzing communicational structure of the organization. According to the direction, communications can be divided into: vertical, horizontal and diagonal communications. Vertical organizational communication takes place at different organizational levels. It can be “downward” and “upward” communication. So-called “downward” organizational communication is established between the higher organizational levels and lower hierarchical levels. In the “upward” organizational communication the movement of information is in the reverse direction. Although these two communication systems are just the opposite directions of the same communication process, in practice the system of “downward” communication completely dominates over the system of “upward” communication. The “downward” communication system is composed of the transfer of orders, instructions, procedures, etc. Based on what is passed through the “downward” communication channels, Katz and Kahn distinguish five categories of communications. They are: specific commands related to the job (work instructions), the information provided understanding of the task and its relationship with other

tasks (rationalization of work), information about behavior at work and about the way of doing things, feedback from subordinates about their performance, information with ideological character and so on [2].

Communication system made up just of the instructions for the tasks and goals, which ignores the information of the achieved performance and socio-emotional problems of workers, is considered as inefficient system.

For the smooth functioning of the organization there should exist such communication channels through which information can move from lower to higher levels. These are so-called "upward" communications. The content of "upward" communications can be different: seeking additional information and clarification, submitting a report of work, make comments, suggestions etc.

Another direction for communication within the organization are so-called horizontal communications. These communications are established between members of the same hierarchical level. The content of horizontal communications can be different. There are four main objectives in this communication direction: coordination of tasks, problem solving, information sharing and conflict resolution [3]. As a rule, many tasks can not be achieved without coordination that exists between colleagues in the work process. Employees can communicate with each other to solve a problem related to the job, or to solve some personal problem. In this respect, horizontal communication based on socio-emotional relationships, are established among them. The system of horizontal communication can help to solve any conflicts among the members of organization belonging to the same hierarchical level. Horizontal communication provides mutual business and social support to the employees. The result of such behavior can be positive or negative.

Communication within an organization can be held diagonally [1]. These are the communications that take place from the bottom - up or from the top - down, between different organizational units and between people at different organizational levels.

In terms of channels through which they move, communications can be seen as formal or informal. Formal communications are established through formal channels of communication and they are used for the transfer of information with formal content.

Besides the formal, every organization is characterized by the existence of so-called informal system of communication. Such a system is the result of the needs of people to contact each other on various grounds. Informal communication system is often referred to as a system of unofficial news. Two features of informal communications are especially important. First, they are rapid form of communication. That means, informal information are transmitted at high speed. Second, informal information is often "distorted".

The presence of informal communication can have a positive or negative impact on the functioning of the organization. Informal communications are highly subjective and they reflect the personal views and goals of those who communicate. If the individual interests of

those who communicate are compatible with interests of the organization, then the informal communication system is very effective in achieving the goals of the organization. Otherwise, the disparity of interests of individuals and the interests of the organization will serve as an incentive for informal system to demonstrate its flaws.

Based on the content of the process of communication, three categories of communications can be distinguished: communication in connection with the performance of current tasks, communications on general issues of work and work organization, communications that are an expression of socio-emotional needs of members of the organization [9].

Current tasks that are performed within the organization must be clearly formulated, well understood and coordinated. It is also necessary to monitor regularly and to record accurately their performance. Therefore, the communication concerning of the performance of current activities and tasks, includes the transfer of orders and instructions, as well as demanding and giving information relevant to the performance of a specific job.

Except the information concerning the current activities and tasks, for the survival and development of the organization is also important to dispose the information that allow exploring and solving the problems related to the work. With reference to all this, we talk about communication that contains information on general matters of work and work organization.

For the successful functioning of the organization, as well as for increasing organizational effectiveness, it is important that the members of organization contact each other, not only in relation to the tasks delegated to them, but also in order to meet their own socio-emotional needs. Social and emotional support, that in a such way are acquired, contribute to an atmosphere of greater satisfaction at work.

In terms of communication styles, communication can be differentiated on verbal, written and non-verbal. Verbal communication is considered to be of that generating words or speech. Written communications are, generally, formal, in the form of text. Non-verbal are those that are mediated through gestures, facial expressions, appearance, etc. Sometimes, non-verbal ways of communicating are considered to be more important than verbal and written modes, because they hide the true essence of what is communicated.

B. How to manage communications

Communication within the organization can be fraught with many problems that may interfere the communication process and to minimize its final effects. Some of the most common problems are:

- Different assumptions due to which people perceive the messages and information in different ways;
- Semantic problems – problems in communication may be the result of giving a different meaning to the words contained in the message;

- Time – due to lack of time, sometimes information are not sent regularly or are not delivered to all who need them;
- Filtering and tailoring of information – sometimes the information are not disclosed in the whole or embellished with the aim to make them more acceptable to the recipient;
- Decline in the credibility of the sender – if the credibility of the information senders is declined, the greater is the possibility that the information will not be well received by its recipient.

To avoid above and many other problems of communication in organizations, it is necessary to manage communications in an efficient and effective manner. The successful management of communication involves the development of an appropriate communication plan that includes a number of relevant activities of top management in the process of communication.

The first step in the process of ensuring the effectiveness of the communication process is to identify the key stakeholders, ie. people inside and outside the organization who are interested in the fate of the organization and with which management of the organization needs to communicate.

Once the key stakeholders of the organization are identified, it is necessary to assess their interests in a particular organization. If the top management is able to determine the interests of key organizational stakeholders, it will be easier for them to shape the communication with stakeholders in a manner that ensures alignment of stakeholders' objectives with the goals of the entire organization.

After identifying the key stakeholders and their interests, it becomes possible to design specific content of communications. There are the few moments that must be kept in mind when designing the content of communications. Among other things, the information that you communicate, should be fair or accurate. Moreover, you have to try to communicate to the recipient not only the facts but also feelings.

The content of communication plan is also determined by the ways of communicating. Messages can be communicated formally or informally, in writing, verbally or non-verbally, with the use of various means of communication. Regardless of the selected mode of communication, at the launch of the relevant information, top managers must take into consideration the following moments:

- It is necessary to communicate information clearly and concisely;
- It is desirable to eliminate the use of foreign words;
- It is desirable to find the simplest and most memorable ways to impart what we want to communicate. This can be achieved by using common knowledge, common terms, putting a

headers on the written materials that are longer than three pages, using short sentences and the like;

- It is need to be aware of the presence of so-called non-verbal ways of communicating;
- It is necessary to be aware of the possibilities, advantages and disadvantages of electronic means of communication. The fact is that the means of electronic communication have enormous potential to improve the communication system. However, the disadvantage of these means is that they do not provide a complete sense of social presence, ie. a sense that people are involved in a communication process. Moreover, these means prevent spotting non-verbal reactions of the recipient of the information.

The communication plan also needs the determination when communication starts, how long it will take and how often it will be repeated. For the success of communication process it is important to communicate information in time.

Successful communication implies the existence of feedback which allows the transmission of the recipient's reaction to the sender of the information. Feedback allows the sender to make appropriate improvements or corrections of their actions and of transmitted information. Feedback success depends, among other things, on the managers' ability to listen. Many believes that listening is a key segment of the communications. Some of the suggestions for listening improvement are:

- Concentrate on the substance of the information (instead of listening every word try to "catch" the meaning of what you are communicated);
- Focus on the speaker (integrate your thoughts and available information with that you hear);
- Listen to the whole message and then make conclusions;
- Look – notice the signs of non-verbal communications (just listening to what you are served is not effective listening).

IV. CONCLUSION

Organizational communication is an important component of organizational intelligence. Properly created and, by managers, effectively directed, communication system contributes to: better informing members of the organization, more adequate guiding their behavior, more effective identifying and solving organizational problems, a more efficient monitoring, controlling and coordinating all of organizational activities, the successful negotiation, better socialization, the acquiring new and dissemination of existing knowledge within the organization etc. Eventually, all this, contributes to the successful functioning of the organization and to the strengthening of its competitive position.

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Development of Multiplatform CMS System with Zend Framework

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Abstract –This paper presents the use of the Zend framework in the realization of a CMS system that can generate multiplatform web content in a responsive web design approach. Use of a framework can help developers to create better web applications, which are easier to maintain, faster to build, multifunctional and multiplatform based. The Zend framework provides an implementation of the MVC pattern.

I. INTRODUCTION

The emergence of the Internet has led to changes in many aspects of human activity. The biggest impact the Internet has, is the development of the global business environment. The second impact is happening right now, and that is the emergence of smart phones. Today, increasing numbers of people access the Internet via their mobile device instead of a PC. The number of mobile devices in use has already surpassed the number of personal computers. It is estimated that the difference between these two numbers will only increase in the years to come [1]. When programmers are building web applications they have to think not only about user experience on desktop computers but also have to think about user experience on tablet and mobile devices. Because of the great penetration of smart handheld devices it is necessary to build multiplatform and multifunctional web applications.

II. FRAMEWORK

Using frameworks in the world of software development has long been known. However, in the world of web development it is new. A software framework is a set of libraries, and an execution environment that allows programmers to develop web applications faster and more organized. The main idea of the framework is observed after the use of frequently used functions and basic structures upon which programmers can develop their applications. Most experienced developers have their own libraries, which are used on a project basis for faster growth. However, the development of web applications based on open-source frameworks has its apparent advantages. In addition, an open-source framework is more reliable, because it is tested and used by many programmers. The biggest advantage of using frameworks is that all developers in a team working on a project should follow the same rules and conventions when developing web applications. This allows easy integration of new developers to work on the project if they are

familiar with the rules and conventions of the used framework.

A. Zend Framework

Zend Framework is an open source framework for the development of web applications and it is based on the PHP programming language. It contains a group of tools for design and implementation. Each tool contains built-in functions for input and validation of data, caching, security and so forth. Unlike other frameworks, Zend uses a so-called "*Looselycoupled*" architecture. This means that although the framework includes a number of components, these components are the most independent of each other and have a minimum interconnection.

Zend Framework also provides a complete implementation of the Model-View-Controller (MVC) pattern. MVC is a widely recognized design pattern that separates our database and business logic from the presentation layer (in this case, the (X)HTML). Separation of presentation and logic aids in maintainability, by producing clean and understandable code. Furthermore, it means that the developer can update the layout and design of a site without having to worry about wading through PHP script tags. The Zend controller is an implementation of the MVC design pattern (Figure 1). When the browser sends a request, the dispatcher searches the according controller to handle the request.

Software design patterns are a standard solution to common problems. This means that although implementations and solutions are different, the concept of problem solving is the same.

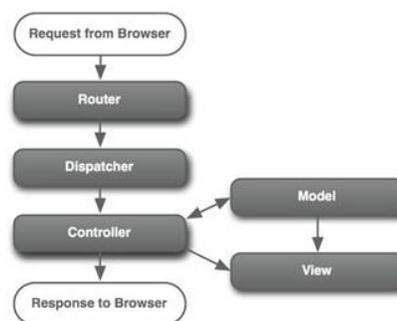


Figure 1. Design of the MVC pattern in Zend, which shows the three main parts of a web application

B. Models

Almost every application has its own database, regardless of whether it is something as simple as a username and password or as complex as an online shop. In MVC, the data are layered and presented with one or more models. The models provide tools to download, read, delete, and in general manipulate data. This layer is completely ignorant of how data are displayed to the user. It provides an independent logical interface for the manipulation of application data.

C. View

The view is the logical display of an application. For web applications it is mainly HTML code that makes a web application, but other types of code can be included, for example XML, which is used for RSS feeds. Also, if the site allows data export to CSV format, the generation of such a file would be the job of the browser. Viewers are also known as the templates because they allow displaying the data generated in the model. It is also common that the more complex templates transfer in the so-called *ViewHelper*. They help for better exploitation of code.

D. Controller

The controller is the code that makes the rest of the application. For web applications, the controller is the one who decides what will be executed based on the user's current request. For Zend applications, the controller is based on a design pattern known as Front Controller that uses a handler called *Zend_Controller_Front* as a command for action (*Zend_Controller_Action*) working in tandem. The front controller accepts all server requests and runs the appropriate action. This process is known as the routing and dispatching.

III. RESPONSIVE DESIGN

Most often we have seen that there is no optimization and adaptation of existing sites or new sites for mobile users. The web content might be too wide to fit the screen of mobile device – user equipment. Often, web pages that have been initially designed for desktop computers are too encumbered with content so they are practically unsuitable for users accessing them via mobile devices [1].

A solution for this problem is to use some kind of detection and adaptation. In the development of this CMS system a responsive design approach is used. Responsive web design is the approach that suggests that design and development should respond to the user's behavior and environment based on screen size, platform and orientation. The practice consists of a mix of flexible grids and layouts, images and an intelligent use of CSS media queries. As a user switches from his laptop to his iPad, the website should automatically switch to accommodate for resolution, image size and scripting abilities. In other words, the website should have the technology to automatically respond to the user's preferences [2]. This approach could be used if developers are confident that the access devices fully support the filtering of media and when a mobile website is dedicated to a specific group of users who have devices with the possibility of filtering media [1].

A. Responsive design in action

The idea is to first code the *Default layout* (width of 992px), and then use CSS3 media queries to code several child layouts: 768px, 480px and 320px width. The *Default layout* will be served to any browsers that do not support media queries, whereas the child layouts will be served, as appropriate, to browsers that do. They will also inherit all styles given to the *Default layout*, so coding them is very fast. To break it down, recent versions of Firefox, Chrome, Safari, Opera, Nokia Webkit, WebOS, Blackberry OS, as well as Internet Explorer 9, Android Webkit, and Mobile Safari (all iPhones, iPads, and iPod Touches) will use the layout most appropriate to them. Internet Explorer 6–8 and most old mobile devices will only use the *Default layout*.

The goal is to make building websites with multiple layouts efficient, and to make the layouts feel consistent. Since every layout is based on the same grid, elements used in one layout can often be reused in the others without changing them. For example, simply adjusting the width or font-size of an element in one layout is often enough to make it work in another. And even if more changes are re-quired, the common baseline grid and type presets will make the element fit in. Figure 2 shows the main page of the CMS implementation, which uses this approach.



Figure 2. Main page shown on mobile device

IV. IMPLEMENTATION OF CMS SYSTEM

The reason why PHP is growing so rapidly as a server-side scripting language is that it is easy to learn. Many functions are included without needing any sort of namespace importing, and programmers don't even have to write object oriented code if they don't want to. Variables are weakly typed and the syntax is fairly familiar. But PHP's ease of use is also its downfall. Because there are fewer restrictions on the structure of the written code, it's much easier to write bad code.

PHP frameworks like CakePHP, CodeIgniter and the Zend Framework provide a solid structure for code whilst also offering some extra functionality that would be much harder to replicate on its own. It's important to note that

the frameworks mentioned follow the MVC pattern. Making multiplatform based sites in this way is easier.

In the realization of this CMS system the following technologies are used: HTML5, CSS3, JavaScript, AJAX, jQuery, PHP and MySQL database.

This CMS system is divided into front-end development (public) and back-end development (administration). The public part is more focused on interactivity, design and optimization for mobile devices. The public part consists of *main page*, *ablog section*, *agallery*, and *pages*. The main page or index page is the place where we want to segregate important information or parts of our site. The blog section consists of articles, which can be filtered by categories or tags. A single selected article contains headline, date created, category that belongs to, body text, social widgets, tags, related posts and facebook comment. The gallery consists of albums. While pages are used for creating independent pages like ‘about us’, ‘contact’ etc.

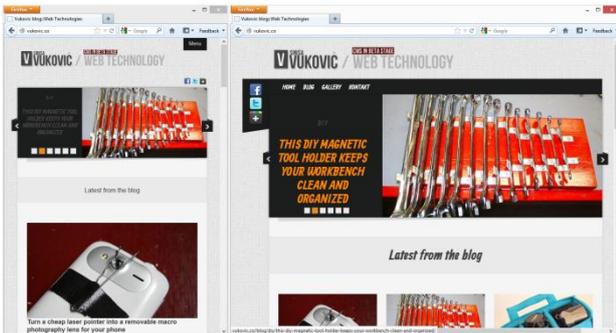


Figure 3. Index page in public section

The administration part is protected and only two types of users can access it – administrators and writers. Depending on the role some parts of the administrative area are not accessible. This panel consists of *dashboard*, *users*, *categories*, *posts*, *pages*, *menu*, *gallery*, and *settings*.

For creating a post we first have to create a category. Ordering categories is eased by *drag n’drop* support.



Figure 4. Drag and drop support for ordering categories

A blog post consists of a headline, a slug (friendly URL), a category list, a headline image, the body text, and tags. Pages are similar to blog post, except they don’t need a headline image and tags.

Menu management gives dynamism to our system. With this, we can easily maintain our main menu.

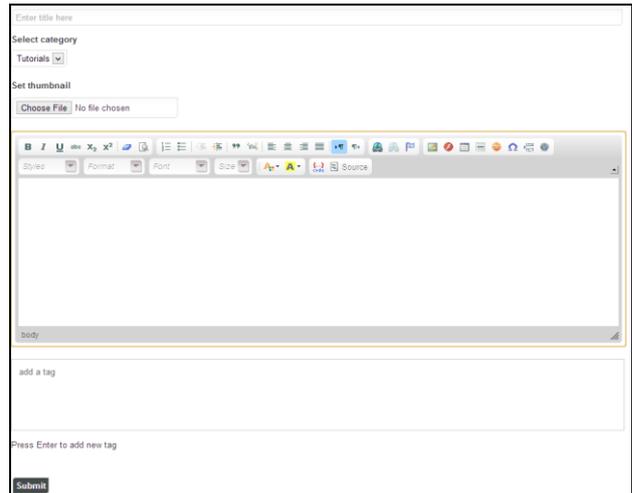


Figure 5. Section for adding posts

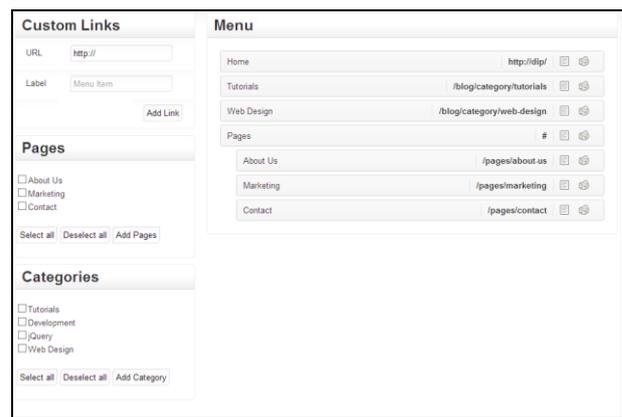


Figure 6. Menu management section

The gallery section consists of albums and images. Uploading multiple images is done with the *Uploadify* script, which uses a combination of flash and javascript to upload images; once an image is uploaded it is passed to PHP to do the rest.

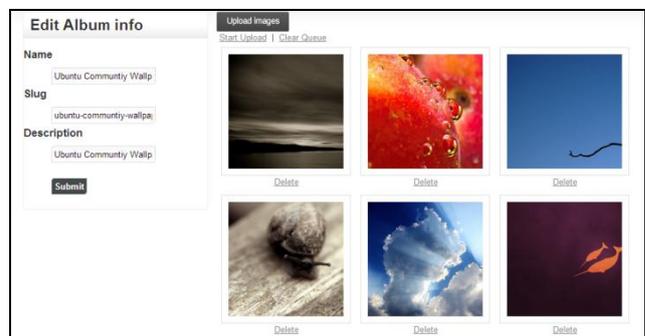


Figure 7. Uploaded images in selected album

V. CONCLUSION

Developing web applications with frameworks reduces development time and increases maintainability. Using responsive design increases the support for multiplatform with a minimum effort and with only a single design. The main disadvantage of optimization based on CSS media queries is that only a small number of old devices support it.

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QR Codes in Creative Economy: Case Study on Vinca Archaeological Site

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Abstract - Cultural and creative industries are increasingly becoming important components of the modern economy and they constitute one of the few economic sectors where dynamic future development is expected. These trends are sometimes considered to represent a “creativisation” of the economy and building new developmental paradigm known as a creative economy where the application of new technology and multimedia is essential in bordering access to creative content. This paper deals with existing practices in application of QR codes in cultural and creative industries and ways of interfacing cultural content and the technological imaginary. The paper investigates the possibilities of use of QR codes in museology from the perspective of a successful marketing tool, as well as the elements of creation of the designed QR code and their contribution to brand reinforcement. A possible way of creating QR code for the needs of branding the cultural heritage has been shown at the example of Vinca culture.

I. INTRODUCTION

In the last decade a large variety of debates on new sources of growth and well-being were started, and the contemporary studies and findings have pointed out to the beginning of a new development paradigm dominated by knowledge, creativity, uniqueness and skills. In international academic and research practice it is possible to find different terminology for describing a decade in which creativity is added economically relevant factor, such as “creative economy”, “the economy of experiencing”, “symbolic economy” and so on. Common to all these neologisms is that they describe, from different perspectives, new economical tendencies whose core is transformation of economy in which creative resources go through a economic valorisation, and the cultural and symbolical landmarks determine economical activities at a rising pace. Some authors recognize that cultural industries have an important contribution on the economy and society by introducing a new concept of economic growth and development, and that they constitute one of the few economic sectors where dynamic future development is expected [1]. These trends are sometimes considered to represent a “culturalisation” of the economy [2] or the “creativisation” of the economy [3].

Connecting creativity and new technology has become unavoidable considering that institutional structures, relations and organizations of the creative

sector enable expressing creativity and its distribution [4]. Increase in leisure and the size of creative contents encouraged the development of new concepts which are made to describe all the changes and complexity of relations in the areas of culture, economy, creativity and technology such as creative economy. United Nations Development Program (UNDP) defines creative economy as a holistic concept of looking at development, which deals with cultural, economic and technological interaction within the globalised world dominated by symbols, texts, sounds and images [5]. In any case, they highlight the central role of the culture sector and creative industries in building a creative economy [6].

The creative sector uses industries of experiencing and cultural tourism to enable maximum economic effects through the exploitation of heritages. Today’s most wanted tourist destinations are the ones which adjust their offer to tourists’ needs giving them a range of different activities and experiences. In that case, a cultural product would be a unique emotion, experience, since sightseeing itself is not satisfactory. Theme parks and museums can try to win consumers in a creative way [7].

By examining the occurrence of museum visits and the attractiveness of such leisure activity in general with Serbian youth, as the most mobile group, we encountered low results. What worries the most is that even 85.8% of high school students [8] and almost as many university students (83.5%) [9] in Serbia rarely or never pay a visit to museums. Some of the causes of such low results are low standard of living, specific youth characteristics as a social group and their attitude towards public cultural life. Insufficiently attractive museum offer and the way of presenting cultural heritage (uninventive and non interactive exhibitions) are also possible causes of seldom visits to museums. On the other hand, Europe has a rising number of tourists whose main motive is a cultural holiday. They are more educated, better consumers, they travel in a group and belong to a group of tourists with higher incomes [10].

As a country with rich cultural resources, at the crossroads of European roads, Serbia has a good potential for the development of cultural tourism. Unfortunately, in our country recklessness and unsystematic approach in the areas of culture and creative industries lead to a situation where cultural heritage resources had often

become forgotten by the greater audience, even though they could be used for creating a positive image of Serbia. Vinca archaeological site is one of those examples because real treasure is set on a landslide which has not been taken care of for several years already.

More than a century is the period in which researches have repeatedly claimed and acknowledged the domination of ancient Vinca culture, thus giving it the feature of one of the most developed, if not even the most developed Neolithic capital. Vinca owns that status to (among other things) great achievements of her inhabitants in crafts, technology, art and economy. Just a few of them are architecture, habitat urbanism, quality and production of pottery and the signs on practically every piece of pottery, and not to mention the discovery of the first metallurgy in the world [11].

Taking into consideration that Vinca was a trade center of Eastern Europe, and that it was using items representing the result of creative manufacture, that this was the period of the first simple economic community and establishing of social layers, we can observe that even in this period one can find arguments of protocreative economy [12]. Nowadays, after almost six millenniums since the disappearance of Vinca culture, we are again discussing the potentials of creative economy, [13] and therefore it seems at an explicit level, in public policies there are rediscovered conclusions that creativity, knowledge and uniqueness are main resources in building an economic and also cultural competitiveness.

Arrangement of the area of the archaeological site and creating an attractive cultural-touristic offer through invention of different cultural itineraries could make the archaeological site a unique tourist product, keeping up with continuous marketing activities may achieve the aim of increasing the interest of potential visitors for a certain site, since it is not until the brand name is followed by a fair reputation that capital value can be expected, i.e. it represents the most valuable estate [14]. As the mission of branding is building an identity with separating oneself from the competition, and positioning of the service product, therefore the branding activities require continuity and all inclusiveness. The quality of the achieved brand image is also directly manifested through the loyalty level, [15] and thus transferred to tourism area. That would signify an increased interest in particular cultural, archaeological and other historical sites, which without suitable marks of rational, emotional and symbolical meanings would not be satisfying cultural and tourist needs of a variety of users.

In order for a particular brand to separate itself within the consumer's mind from another competitive brand, it is necessary to cover all the contact points with potential visitors and secure the consistency of all the elements in the tourist offer. Unanimity ensures the sense of security within visitors and helps them decide on the choice of a tourist location. Visual identity is also one of the main instruments of branding. Coordinated with other marketing promotion instruments, it adds to reinforcing the identity of the archaeological site. Also, an archaeological site brand has to, apart from name and

other identity features, motivate, trigger, evoke emotions, associations etc [16].

New technologies enable multimedia promotion, together with media convergence. QR codes as a product of new technology make it easy for smart telephone owners to gain information, whereas they also can play a significant role in brand promotion and development. According to that, a challenge in rising usage of mobile communications is represented in creating QR codes in marketing activities for promoting cultural heritage and potential tourist itinerary.

II. MULTIMEDIA CHARACTER OF QR CODES

QR code (quick response) is a two dimensional symbol similar to a bar code, but it is different because mobile phones can read it and it has a bigger capacity for storing data than a classical bar code. The symbols were created in Japan, in the Denso Wave corporation in 1994 and the purpose was to mark the airplane parts [17].

Instead of entering an internet address, by scanning a QR code the internet search engine is directly pointed to a desired internet address which is in a raster of a QR code square. Reading QR code used to be possible only if mobile phone had a camera, internet access and a specific application installed, whereas today there is an automatic option if logging because of the increasing usage of smart phones. Smart phone sales worldwide are constantly rising, and the availability of technology complementary with QR code, their free, easy creation and usage as well as various creative ways of the exploitation encourage the usage and introduction of the codes [18].

Easy code generating, without significant extra expenses, and with readjusting the existing site to mobile phone navigation, becomes even more popular an option of content availability (from commercial to non-commercial ones). The limitless possibilities offered in their making speaks about the so-called art of creating QR code (QR Art) as a new art discipline in a digitalized social environment. In this context it is of interest to mention the example of creating QR codes by young artists, as their computer interpretation of certain works of art and creating a virtual exhibition of QR codes in Portland's Museum of Art, conducted by an art historian K. South in October 2011. The purpose of the exhibition was promoting a new dimension of digitally created works of art, which one could enjoy in a digital environment, without a real space needed for representing traditional visual arts [19]. The affirmation of QR codes as a new art discipline was realised also by the Museum of Modern Art in New York, organising an exhibition called „Talk to me“ which explores communication between things and people using QR codes [20].

Once the QR codes are decoded, it is possible to connect in several ways: by web browsers, IM, email, SMS and even streaming video [21]. The main advantage is low production expenses, less burdening a visual content with textual descriptions, easy availability, [22] so overall it makes them suitable for usage in all areas of cultural heritage (archives, museums, libraries, sights and so on). What is specific about that multimedia content is the fact that creating a QR code is in a way representing a

new context and perspective of museology in a digitalized world. In that manner, the present stereotypes, for example the static of museum exhibitions and cultural heritage, its monotony, non-creativity and traditional way of presenting, collapse with the usage of digital, multimedia technologies which can be used primarily in creating a new experience and reliving of cultural heritage.

Even though the QR codes have ruled in Japan, as one of the most developed countries in the world, the rest of the world is still awaiting their dominance. Actually, the research conducted by Archirval Company shows a rather discouraging result. The point is that even though majority of the USA university students own smart phones, only 21% of them knows how to use a QR code, i.e. to scan etc [23]. Therefore, even amongst university population, which is also the most prone to new technologies, there is a certain resistance towards QR codes and such kinds of promotions. Owing to that, QR codes have to be observed as only one way of promotion, and definitely not as the only one. It is essential to raise public awareness at the users about the possibilities of QR codes and their popularization, in a stimulating way, in order for them to become one of the major elements of brand making in the future.

III. USAGE OF QR CODES IN CREATIVE ECONOMY

Since they are very popular in culture and creative industries, QR codes can be used for creating new media contents in museology [24]. They are used as navigation for audio guides in exhibitions, and quite often they become a permanent item of the exhibition, reconstructing the artifacts in a way and enriching the visitors' experience in exhibitions [25]. The area of social games is especially attractive because it involves a great number of people in a creative way. Simon Poulter and Watershed and HP Labs created in 2005 a phone game based on QR codes. The aim of the game was to do a jigsaw puzzle consisting of a lot of QR codes which were in the area. All pieces coming together made one big QR code which, when installed, would show a quote from *Glass*, a popular novel [26]. In another project dealing with cinema heritage, they used a model which could be used for other forms of public heritage, museums, galleries and archives [27]. Aardman and the Museum of Bristol are exploring mobile technologies, virtual mapping and social gaming to create new media narratives. The project stressed the possibility of reading a QR code in a closed space, whereas outdoors GPS is used [28].

In Serbia they are less used, but successful examples can be found. For instance, the Air Force museum was among the first to use QR codes as instruments of museum promotion, and they were used in recently held manifestation *Usce Open Air* [29], and their wider usage is familiar, outside the borders of culture and creative industries. For example, Erste bank introduced QR codes last March so as to provide its clients with simpler meeting arrangements with a consultant at the time it suits them, while some hotels use QR codes in the everyday practice [30].

Limited usage of QR codes in our country cannot be only due to low interest of relevant factors in the area of culture and creative industries. The most common problems occurring in the implementation of the technology in marketing in our case are bad optimization of internet sites for mobile phone usage and bad navigation.

QR codes have occupied a significant position in pop culture, so it is possible to make a T-shirt with a QR code which takes you to a favorite song, film or website of the person wearing, etc [31]. Their application significantly broadens the exploitation possibilities of creative contents beyond the sphere of culture and creative industries. That means it could be observed as innovation in usage of creative contents, a possibility for spreading the economically sustainable culture and creative industry.

IV. THE RESEARCH

Nowadays brands become a part of culture lifestyle and a way of establishing identity, and the experiencing of a destination obtains an important emotional component. Because of that, it is needed to estimate which the key motives for tourist arrival are, and what values participate as the relevant ones [32]. Since tourists cannot have an experience beforehand their visit, a series of marketing activities are started. Brochures, promotion in the media and PR do have a significant role, but personal recommendation is priceless [33]. Various options of QR code emerge, and it could have a significant role in making Vinca culture more familiar to the site visitors, as well as probable visitors and other people interested in the site. Usage of color and implantation of a logotype in QR codes would contribute to the site promotion. On the other hand, installment of QR codes immediately next to an artifact, in a future archeological park, would help the understanding of Vinca culture and knowledge of the park visitors through providing extra information on the artifacts, and it would be possible to connect it to a 3D animation or an existing documentary about the archeological site. A significant aspect can be a virtual exhibition of Vinca culture artifacts which would be available to a wider audience through QR codes. Also, this technology could offer detailed information about the site in several languages which would be set on the book editions, catalogues, posters and other printed material.

The trend of printing a QR code on tops and treating a QR code as a fashion detail on the one hand, and on the other as a cultural phenomenon, may introduce the cultural heritage to youth population (especially university students) in an interesting way. The youth, as the most common user of high technologies, is treated in sociology as a sub cultural phenomenon of a specific identity and it has particular, individual styles of behaviour apart from passive enjoyment in such contents the youth could be a creator of new QR codes. This fits into young people socio-economic profile, which quite often cannot satisfy their cultural needs due to limited financial resources [34]. Furthermore, a combination of technology and cultural contents would enable the youth to actively participate in creating a cultural experience, and not to treat them as passive consumers, while

simultaneously helping them to expand their knowledge and information on the topic. This is of particular significance for young population, considering the latest research on the cultural lifestyle of university students, where the educational contents are at the top of the content list which students could enrich their cultural life [35].



Figure 1. Optional QR codes for the promotion of different tourist itineraries related to Vinca archeological site

The visitors could also be filmed in one of the offered tourist itineraries in Vinca (Culture routes, Food routes and Adventure routes)[36] during their activities. The footage of their authentic Vinca experience could then be uploaded to YouTube, and what is more, they could buy as a souvenir a T-shirt with a QR code which leads directly to their footage of Vinca adventure. In this manner, cultural reliving and experience would be personalised, which may evolve in popularity, and documenting tourist experience through photography, which have been so far the most popular and most common kind of active cultural habits of (non)tourist visitors at historical locations. What is more, the T-shirt would also contain a message of their own choice, written in Vincica font (font created according to Vinca signs) [37]. That would result in strengthening the emotional benefits of the brand, since it is this dimension which has emerged as the most significant value component in modern tourism [38].

All above mentioned activities would lead to increase and interpretation of a cultural content in a new manner, which would start a rise in interest for cultural events and contents in the public cultural sphere (institutions, museums, archives, cultural heritage etc.), which is the main problem of the youth cultural policies. Latest research shows that two main reasons for the youth's rare visits to the institutions of culture and cultural experiences are weak interest (17%) and unsuitable offer (16.4%) [39].

V.CONCLUSION

Despite the repulsiveness to usage of QR codes, the increase in the sales of smart phones worldwide and in our country benefits their usage, increasing the probability of using this technology in culture and creative industries. Nevertheless, we have to bear in mind

that QR codes are not favourite to all target groups, only to the young and that is a population aged 15-25, who are a great user of the internet and new technologies. Bad material situation in Serbia must also be taken into consideration, since it certainly slows down its integration into new technological trends, therefore leading to low knowledge of the possibilities of QR codes, and their creative usage in culture and creative industries. Branding is necessary especially in the sphere of culture and creative industries as a new way of accessing to symbolic contents. In the countries such as ours, where there are low cultural habits and the treatment of culture and cultural industries has been set in the margins, new technologies can help in arousing the participation in culture, especially due to the fact that the young most often use the internet as a source of information, fun and education, and that rarely do they give up on it [40]. Constant consciousness arousal and diverting to QR codes is an option for introduction as many people as possible to the concept itself. It is only through a long promotion process of the technology that we can expect QR codes to become one of the core features of branding in Serbia.

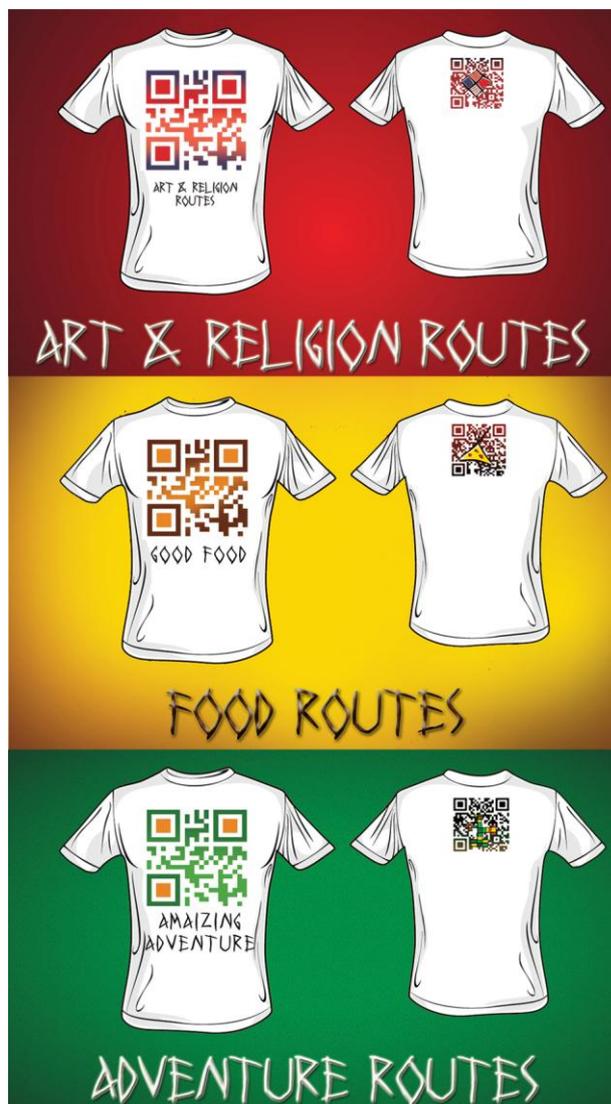


Figure 2. Optional shirts with QR codes for the promotion of different tourist itineraries related to Vinca archeological site

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Analysis of Internet and Facebook Use Among College Students

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Abstract - The use of Information and communications technologies (ICT) among students has become the subject of numerous studies. In this study we were interested in differences in patterns of online behavior and use of Facebook (FB) among two generations of college students. Based on the results of our study we can conclude that the time being online increases, as well as the number of FB users among college students, and also increases the number of virtual friends with the purpose of information exchange.

I. INTRODUCTION

College students use the Internet at very high rates, in fact, going online has become part of almost every undergraduate's daily routine [11]. Consequently, it is important for higher education professionals to understand the academic, social, and psychological effects of Internet use. College students are a group that may be particularly vulnerable to addiction, as they have largely unfettered, unsupervised access to the Internet and independent control of their time. Fewer studies were set up to explore the academic effects of Internet use [1, 8, 11, 13, 15, 16]. The emergence of newer Internet applications such as the social network site Facebook only intensifies this need; especially since a large majority of college students have social network site accounts, which they check multiple times a day [7, 14, 20, 21]. The first study of college student Facebook use and academics indicated that Facebook users study less and earn lower grades than non-Facebook users, while other researchers have found positive and/or null relationships between Facebook use and grades [2, 4, 8].

Created in 2004, by 2007 Facebook was reported to have more than 21 million registered members generating 1,6 billion page views each day [17]. The site is tightly integrated into the daily media practices of its users: the typical user spends about 20 minutes a day on the site, and two-thirds of users log in at least once a day [3, 17]. The most recent data, collected by the EDUCAUSE Center for Applied Research (ECAR) from a sample of 36,950 students from 126 U.S. universities and one Canadian university, showed that of the 90% of students who use social networking websites, 97% said they used Facebook. This 97% reported actively engaging on the site daily [22]. As of January 2012, Facebook had more than 845 million active users (up from 600 million at the end of

2010) and accounts for one out of every five page views on the Internet worldwide [10]. Facebook is available in more than 70 languages, 80% of users are located outside the United States, 50% of their users log in daily and the average user contributes 70 items per month [6].

According to EUnet company data, in Serbia about 1,5 million people use the Internet every day, accounting for about 25% of the total population, while the European average shows 50 to 70% of the population are every day Internet users [23]. About 50% of people in Serbia have never used the Internet and have no intention to, because they feel they do not need it. Serbia, with as many as 2.716.340 open accounts on this social network is at the first place in the region, 17th in Europe, and since December 2009 to date, number of users in Serbia has increased by about 40 percent [9]. Research shows that there are more male FB users in Serbia (56%) than female (44%), and most are between ages 18 and 34 (61%).

An increasing number of studies have examined how college students, and youth more generally, use ICTs (Information and Communications Technologies) [5, 13, 18, 19].

Social Network Sites (SNSs) such as such as Friendster, CyWorld, and MySpace allow individuals to present themselves, articulate their social networks, and establish or maintain connections with others. These sites can be oriented towards work-related contexts (e.g., LinkedIn.com), romantic relationship initiation (the original goal of Friendster.com), connecting those with shared interests such as music or politics (e.g., MySpace.com), or the college student population (the original incarnation of Facebook.com). The social and interactive nature of Social Networking Sites (SNSs) presents the intriguing possibility that by enhancing social interactions with and among students through the use of an SNS such as Facebook, instructors can increase the overall quality of engagement in a given instructional setting and, thus, create a more effective learning environment.

As students use of the Internet continues to increase, so does the need for institutions to understand the role the Internet and FB are playing on the college.

Thus, in this study we were interested if there are differences in patterns of online behavior and use of Facebook (FB) among two generations of college students.

II. CURRENT STUDY

The current investigation describes Internet and FB use and patterns of online behavior among students at the Faculty of Transport and Traffic Engineering in Belgrade.

The sample consisted of 70 college students who completed the survey, 35 of whom were the second year (60% male and 40% female); as well as 35 of the third year students (45% male and 55% female). Students engaged in the course of Traffic Psychology were invited to complete a self-reported questionnaire on patterns of Internet and FB use. The survey consisted of 45 multiple-choice items. General Internet usage data were collected including: amount of experience, time spent online, type and location of regular usage. FB questions were focused on determining a level of involvement online through: types of usage and level of involvement, amount of time spent, and attitudes toward Facebook.

III. RESULTS

The results show that the majority of second year students (57%) on FB spend less than 30 minutes a day, against to the only 17% of the third year students. A little more time, between 30 minutes and one hour, on FB were engaged 22% of the second year students, and among students of the third year, 40% of respondents. The amount of time spent on FB for second year students, did not exceed 3 hours, as the third year students often spend more than 4 hours online (Fig. 1).

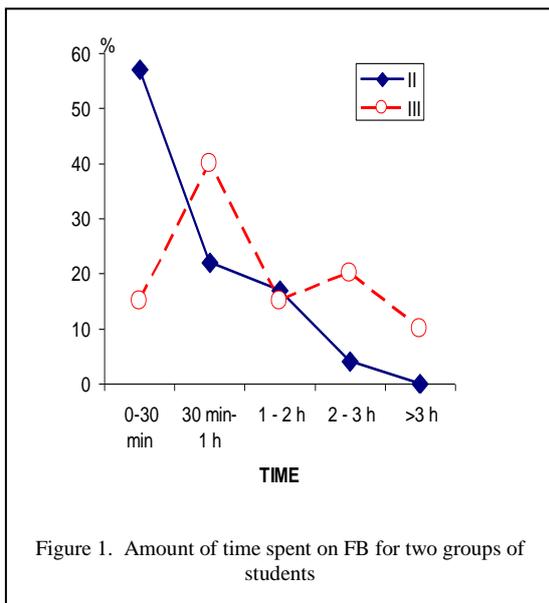


Figure 1. Amount of time spent on FB for two groups of students

Nearly less than half of the second year students and half of the third year students have more than 300 friends. In the second year, there is greater percentage of students who have between 100 and 200, while the ratio is the opposite when the number of friends ranged between 200 and 300. Fewer number of new generation of students have more than 600 friends (Fig.2).

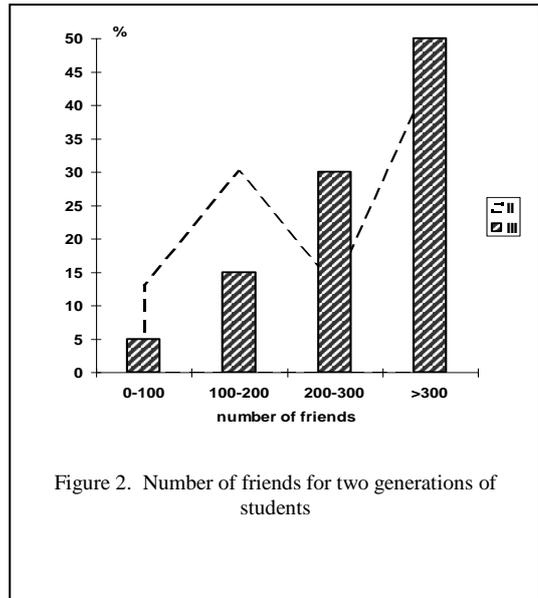


Figure 2. Number of friends for two generations of students

Second year students update more frequently their FB profile than the third year students (Fig. 3). The same stands for writing on their own and their friends' wall.

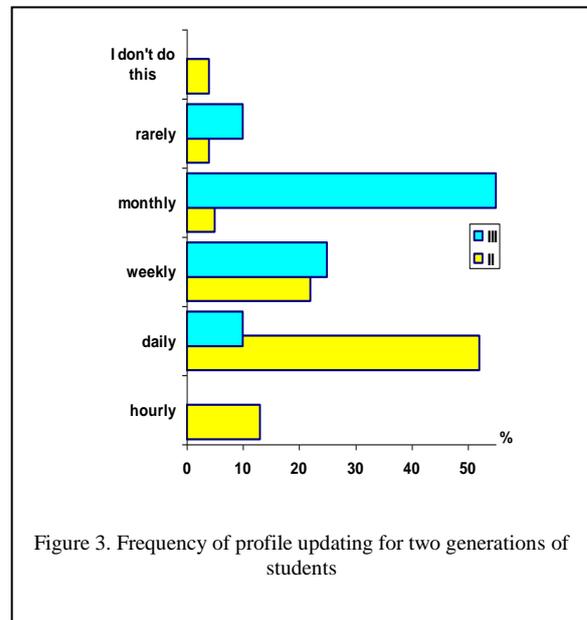
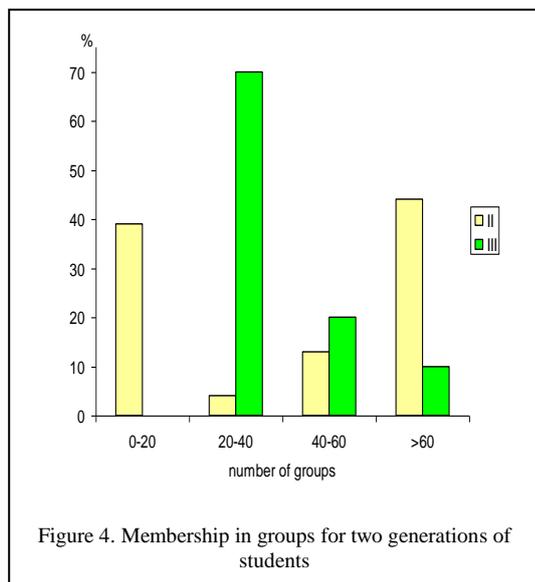


Figure 3. Frequency of profile updating for two generations of students

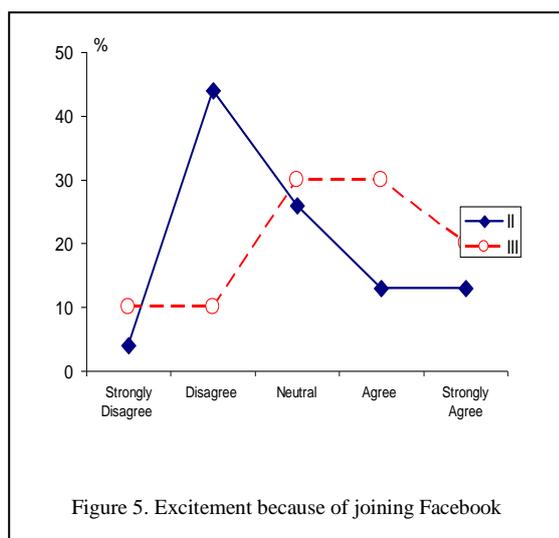
Membership in groups is more representative for the students of the third year (70% joined in the 20 to 40 group). Second year students' membership shows a different distribution, they are members either of small or large number of groups (Fig. 4). Both samples show almost no inclination to be either creators or administrators in their groups.

The second year students deny that they were excited to join the FB, it is more pronounced feature of the new generation of students. Also, most of the students regardless the year of studying, were not felt as addicted to FB, while 25% of the third year students are willing to admit addiction (Fig. 5 and 6).



66% of first-generation students had FB account, but, in the next generation all of the respondents have a FB account. A third of the previous generations of students were excited to be involved in FB. Respondents also report significantly more Facebook use by involving people with whom they share an offline connection—either an existing friend, a classmate, someone living near them, or someone they met socially than involve meeting new people. The main reasons that respondents indicated for not being engaged FB, were lack of interest and because they didn't want to put personal information online. Currently, most of them are satisfied using FB, and do not plan to turn off their profile. Newer generation of students used FB mainly for overcoming boredom.

In summary, the results show that there are some differences, as well as, similarities between the second and third year students, with regard to Internet and FB use and patterns and motives of online behavior [24]:

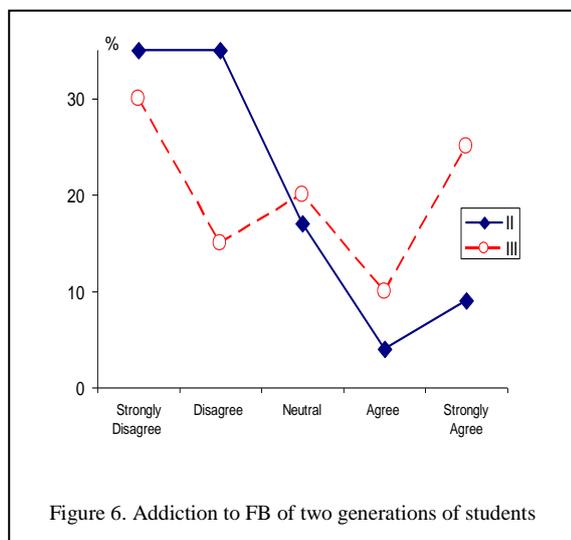


Second Year Students Characteristics

- Fewer number of FB users;
- Longer experience in the Internet use;
- Better academic success;
- Lower percentage engaged in online gaming;
- Less amount of time spent on FB-in;
- More frequently involvement on FB walls and profile updating.

Third Year Students Characteristics

- All of them have FB account;
- Higher percentage engaged in online gaming;
- More frequently checking email;
- Having more “friends”;
- Higher involvement in "groups" and membership in more "groups";
- Higher excitement towards joining FB;
- More willingly to declare that they are addicted to FB.



Similarities between Two Generations of Students

- Not engaged in creating groups;
- The main motive for being involved on FB is to stay connected to high school friends;
- Do not use FB to make social connections that couldn't find in face to face contact;
- Every day Internet use for finding information and academic purposes.

IV. CONCLUSION

Facebook may have a significant impact on students' learning process, and viability depends on the student's academic year, amount of Facebook use, and the purpose of the use. Based on the results of our study, we can conclude that the time being online increases, as well as the number of FB users, and also increases the number of virtual friends with the purpose of information exchange.

Collecting longitudinal data over a series of years, tracking incoming first-year students and following them after they graduate, is also a necessary next step.

In addition, social networking services are increasingly being used by educators as teaching and learning tools that supplement traditional classroom environments as they provide new opportunities for enriching existing curriculum. Given that Facebook continues to be popular among college students, and that universities are interested in engaging and retaining students, it is important for those working in higher education to familiarize themselves with Facebook (and other such technologies) and to design and support interventions that meet students needs. Future research will try to measure the different components in order to decide whether the usage of the social network is worthwhile for students.

ACKNOWLEDGMENT

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The Application of the Artificial Neural Networks in Cryptography

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Abstract – As the main goal of the cryptosystem is to establish a secure communication channel between sender and receiver without any leakage of information to unauthorized listener, a common secret key is a main factor in security of information transfer via an insecure channel. This paper investigates some possibilities of the usage of artificial neural networks for common secret key generation on both sides: sender side and receiver side of the insecure channel. This process is done by neural networks synchronization process, which synchronizes synaptic weights of two neural networks. These synaptic weights are used as a common secret key. The extension of neural networks synchronization process by addition of single layer perceptron unit is described in this paper.

I. INTRODUCTION

The cryptography as a scientific field always had a practical role in both modern and ancient aspect of human communications. This discipline has grown in recent decades, both in scientific and practical domains. This growth was related to new methods and algorithms that were discovered and created. Some of these new methods and algorithms were implemented in a practical way.

As in [1, 2] the main goal of cryptography is to enable two partners to communicate over an insecure channel in such a way that a possible attacker cannot understand and decrypt the transmitted message in a time interval. The length of this time interval should be long enough, so that transmitted message is no longer valid after the expiration of a time interval. In a general scenario, the sender through a key ke encrypts the message. As the result of this operation, the ciphertext is created and subsequently sent over the insecure channel. A third party who listens to the channel should not be able to determine what the message was. However, the recipient who knows the encryption key can decrypt the ciphertext using his private key kd .

In a private key system, keys have to be transmitted by a secure secret channel prior to the start of the communication. In this key-exchange protocol, both partners start with private keys and transmit them using a public protocol. After some transformations, their encrypted private keys lead to a common secret key. In most applications, a public-key system is used. Often, this system is based on number theory where the keys are long integers [1, 2, 3, 4]. However, a novel key-exchange protocol is proposed in [2, 5]. This protocol is based on a learning process of the artificial neural networks rather than on number theory or a public key. This method is

based on a new phenomenon of synchronization of neural networks by mutual learning [2]. The main goal of this paper is to investigate the possible applications of the artificial neural networks in the cryptography domain, which leads to a more secure cryptosystem. The research of the phenomenon of synchronization of neural networks is most important in this context. Expected contribution will be an insight to the applicability of simple perceptron based neural networks in the cryptosystem.

The paper is organized as follows: After Introduction, chapter Cryptosystem contains some basic definitions. Chapter Synchronization of the neural networks describes mutual learning process of two neural networks and possible applications in the domain of cryptography. Finally, section Conclusions contains some conclusions and remarks, as well as future work directions.

II. CRYPTOSYSTEM

A cryptosystem refers to a set of algorithms needed to implement a particular form of encryption and decryption. Usually, cryptosystem is defined by:

1. Encryption algorithm E .
2. Decryption algorithm D .
3. Key space K .
4. Message space M (open text or plaintext).
5. Cipher space C .

The encryption algorithm is defined by an following equation:

$$c = E_{ke}(m),$$

where $c \in C$, $ke \in K$, $m \in M$. The key ke is the encryption key.

The decryption algorithm is defined by an following equation:

$$m = D_{kd}(c),$$

where $c \in C$, $kd \in K$, $m \in M$. The key kd is the decryption key.

Following equation must be satisfied:

$$m = D_{kd}(E_{ke}(m)).$$

Figure 1 shows usual representation of the cryptosystem.

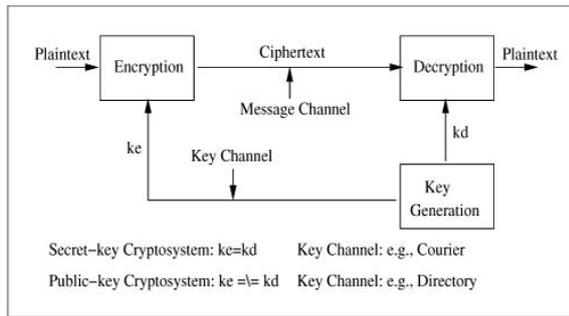


Figure 1: The Cryptosystem

Plaintext or open text is processed by encryption algorithm and sent via insecure channel. After that, decryption algorithm restores original plaintext. Typically, cryptosystem consists of three algorithms: encryption, decryption and key generation algorithm. The idea presented in further chapters is to use a pair of synchronized artificial neural networks to generate shared secret key, so that the same key is used by sender and by receiver. The same secret key is generated on both, sender and receiver sides separately.

III. SYNCHRONIZATION OF THE NEURAL NETWORKS

The main idea is to construct two feed-forward neural networks, which are able to synchronize in a finite time. Two feed-forward networks are able to synchronize their synaptic weights by exchanging and learning their mutual outputs. This process is fast; the number of bits required to achieve synaptic synchronization is lower than the number of components of the weights [2]. After synchronization, the synaptic weights define the common time dependent private key.

Synchronization process is shown on Fig. 2. The weights of two nets NN1 (e.g. sender) and NN2 (e.g. recipient), are synchronized, thus producing time dependant private key $ke(t) = -kd(t)$.

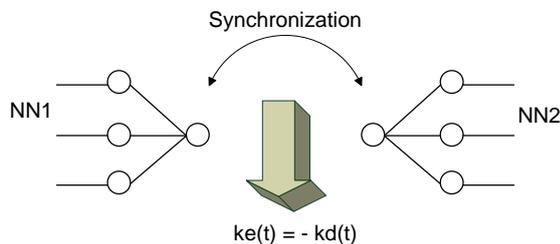


Figure 2. Synchronization process of two neural networks

A. Neural Network Architecture

The architecture of two neural networks used in synchronization process, differ from the architecture of standard feed-forward net. There are $3N$ inputs denoted by x on Fig. 3. These inputs are transmitted to three hidden units y , by weighted vectors w . The final output O

is calculated as a product of hidden units. The output O is a single bit that is used for networks synchronization.

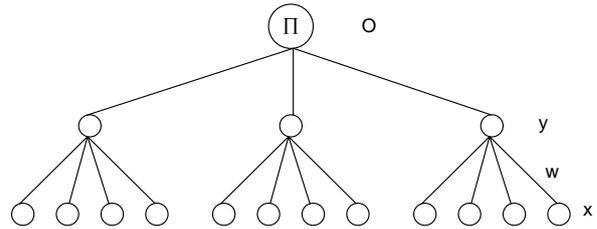


Figure 3. Neural networks architecture

For simplicity there are three hidden units, $K=3$ and KN inputs. Weighted vectors for j -th input w_{kj} , where $k=1, \dots, 3$ takes integer values $-L, -L+1, \dots, L$. Weighted vectors are bounded by L . The secret information of each of the two neural networks is the initial values for the weights: w_{kj}^S for sender and w_{kj}^R for receiver. Each vector consists of $3N$ inputs. Sender and recipient do not know the initial weighted vectors of their partners, which are used to construct the common secret key.

Each neural network is trained with output of its partner: NN1 is trained with the output of NN2, while NN2 is trained with the output of NN1, (see Fig. 2.). For this operation a new common public input vector x is needed for both NN1 and NN2.

The output is formed after two-step process:

Firstly, the outputs of the hidden units are calculated as follows:

$$y_i = \text{sgn} \left(\sum_{k=1}^N w_{kj} x_{kj} \right) \quad (1)$$

Here $i = 1, \dots, 3$, and

$$\text{sgn}(z) = \begin{cases} -1, & \text{if } z < 0 \\ 0, & \text{if } z = 0 \\ 1, & \text{if } z > 0 \end{cases}$$

In the case of $y = 0$ sender or recipient sets the hidden unit value to 1 or -1 .

In the second step, the final output O is formed as a product of the hidden units:

$$O = \prod_{i=1}^K y_i \quad (2)$$

There are two output bits: O^S for sender and O^R for recipient. As the output bits are mutually exchanged between sender and recipient, it is possible that the product $O^S O^R < 0$ (the sender and the recipient do not agree on the current output). If this happens the weights of the sender and recipient are updated according to the Hebbian learning rule.

if $Oy_k > 0$ then $w_{kj}^{t+1} = w_{kj}^t - O x_{kj}$
 if $|w_{kj}| > L$ then $w_{kj}^{t+1} = \text{sgn}(w_{kj}^t)L$

By words: if the product of the final output O and the value of the hidden unit y_k is bigger than zero then new value of weight is calculated as the difference between old weight value and the product of final output and corresponding input. On the other side, if the absolute value of corresponding weight happens to be bigger than value of L (weighted vectors are bounded by L), then new value of weight is calculated as the product of the sgn function of old weight value, and L .

Simply put: by usage of the *Hebbian* rule, the sender is trying to imitate the response of the recipient and the recipient is trying to imitate the response of the sender [2].

B. The Extension

The extension of synchronization model proposes different calculation of the final output O . The main idea is to calculate final output $O \in \{0,1\}$ by perceptron type artificial neural network. The perceptron network (Rosenblatt's perceptron) is a single layer neural net shown on Fig. 4.

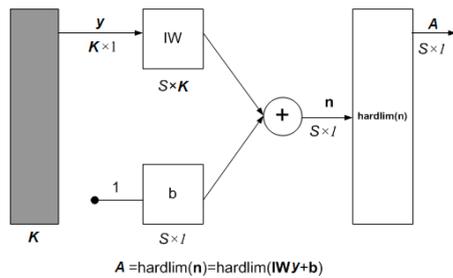


Figure 3. Perceptron architecture

Here, S is a number of neurons in single layer perceptron neural network, while K is the number of inputs, in this case $K = 3$ because there are three hidden units, b is the bias vector and y is an input vector. Inputs y_1, y_2, y_3 are calculated by (1). The perceptron output $A = [a_1, a_2, \dots, a_S]$ is calculated as $A = \text{hardlim}(IWy + b)$ where IW is $S \times K$ dimension input weights matrix (synaptic weights for single layer perceptron). Hardlim (hard-limited) function is defined as follows:

$$\text{hardlim}(n) = \begin{cases} 1, & n > 0 \\ 0, & n \leq 0 \end{cases}$$

Final output O is calculated as in (3).

$$O = \text{XOR}_{i=1, \dots, S}(a_i) \tag{3}$$

The extended neural network architecture is shown on Fig 5.

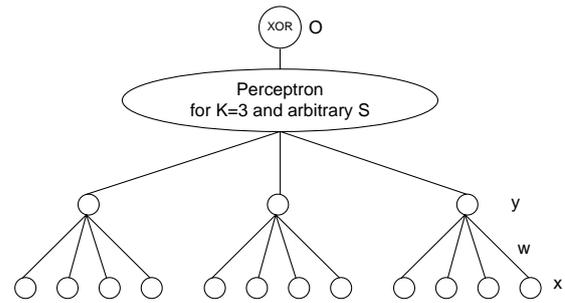


Figure 5. The extended neural network architecture for synchronization process

The extended model for neural network synchronization introduces an additional degree of freedom by the usage of the single layer perceptron, as well as XOR function. This model do not include perceptron learning rule which means that synaptic weights IW and bias vector b are predefined constants, same for sender and receiver.

IV. CONCLUSIONS

The simulations presented in [2] show that after a relatively short time sender and receiver align themselves so that as soon as the two networks are synchronized they remain so forever. According to [2], an important property of synchronizing neural nets is that from the knowledge of the output, the internal representation of the hidden units is not uniquely determined because there is a fourfold degeneracy (for the output 1 there are four internal representations for the three hidden units (1,1,1), (1,-1,-1), (-1,-1,1) and (-1,1,-1)). Therefore, an observer cannot know which of the weight vectors is updated according to equation (2). If we use equation (3) instead of the equation (2), a fourfold degeneracy is preserved (for the output 1 there are four internal representations for the three hidden units (1,1,1), (0,0,1), (0,1,0) and (1,0,0)). Furthermore, the introduction of the secret constant synaptic weight matrix IW and bias vector b , give additional dimension of security, although computational time is not increased because synaptic weights and biases of the perceptron are not changing. In addition, it is possible to define time dependant synaptic matrix IW and bias vector b , for both sender and receiver.

Future work will include the implementation of previously described concepts.

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Use of Corporate E-learning in Telecommunication Companies

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Abstract - The goal of this paper is to present and analyze the use of E-learning in a corporate context. It will describe how creation of learning organizations and knowledge economy led to new business requirements which had to be quickly fulfilled. Telecommunications sector is one of the fastest growing in today's industry and as such, it has to provide constant and cost-effective training of employees. In this case, E-learning is proving to be the best solution for staff education and meeting companies goals in the most efficient way.

I. INTRODUCTION

Globalization and technological changes evolved so much in the last two decades that they have created new global economy which brought new business rules for companies. This economy is knowledge-based and is primarily leaning on use of ideas more than physical abilities of workforce, as well as on smart use of technology rather than simple transformation of raw materials or exploitation of inexpensive workforce. New ways of developing and using knowledge are created due to ever-growing need for innovations.

The new economy forced organizations and companies to recruit, keep and continuously upgrade people with the right competencies and knowledge. Thus, they need to provide development of skills and constant education to their workforce in order to keep up with changes and achieve success and financial growth. With E-learning and modern technologies as tools for enabling that goal, they can take corporate training to higher level.

II. CORPORATE EDUCATION

Training and education in corporate organizations has always been present, whether in form of learning about the job itself and ways of completing various tasks, or managing relationships with colleagues and influence of work environment on society in general, as in [1]. The modern market demands and emerging technologies changed the situation today, forcing employees to constantly learn and improve their skills, and at the same time, enabling them to learn wherever and whenever is most suitable for them.

The corporate training sector can be divided into two groups:

- IT training - Includes application development tools, application software and system infrastructural software. IT training was the primary E-learning market,

guided with the need to develop employee skills for the use of modern technologies.

- Soft skills training – This is used in various areas of business such as management, leadership, communication, team building, sales and marketing, human resources and professional development. It should help organizations to constantly evolve and keep up with the rivals in competitive market.

Phases of educational training in corporate organizations can be summed up as shown in Fig. 1:

- Change management – Besides explaining what is going to be learned, phase that should make clear to employees why they need certain knowledge and how it will reflect on every day business practice.

- Evaluation, strategies and development – Corporate team in charge of training makes estimations of existing skills and knowledge of employees and decides what content should be priority of learning and the best way to achieve it.

- Knowledge transfer and adoption – Besides simple adoption of learning materials, this phase also includes non-formal knowledge and information acquiring through communication with colleagues.

- Business operations – Includes defining business operations and tasks which should be covered with the training program.

- Educational process management – In order to successfully conduct this entire cycle, it is necessary to have experts to manage the whole educational process and ensure timely execution of every phase.

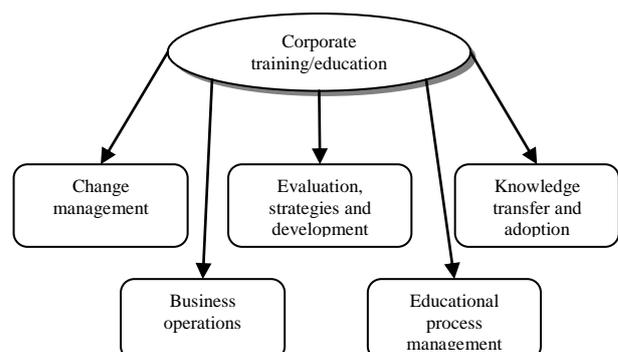


Figure 1. Phases of educational training in corporate organizations

Traditional training methods brought greater expenses to companies when more money was spent on transporting and housing trainees than on actual training programs. In today's competitive environment, organizations can no longer afford to load training budgets with travel and lodging costs. More importantly, time that an employee spends away from the workplace traveling or sitting in a classroom reduces staff productivity and revenue, as in [2]. The need to adjust the way organizations learn in current business environment led to the use of E-learning as a modern, efficient and flexible alternative. The goal of corporate E-learning is to provide the workforce with timely and cost-effective training that creates motivated, skilled and loyal knowledge workers.

III. E-LEARNING IN CORPORATE ENVIRONMENT

In business, learning is the process by which people acquire new skills or knowledge for the purpose of enhancing their performance with a specific goal to improve workforce performance and to make people work better, so that the organization increases its value. It can be said that learning is a conscious attempt on the part of organizations to improve productivity, effectiveness and innovativeness to meet market conditions. In the corporate context, training is the way the instruction is conveyed: it supports learning that is the individual's internal way of processing information into knowledge. It can be defined as the way instruction is conveyed while learning is the individual's internal way of processing information into knowledge, as in [3].

E-learning is defined in different ways from various authors, but always encompasses main idea of learning experiences delivered or enabled by electronic technology. According to [3], e-Learning refers to the use of internet technologies to deliver a wide array of solutions that enhance knowledge and performance. It is based on three fundamental criteria: (1) E-learning is networked, which makes it capable of instant updating, storage/retrieval, distribution and sharing of instruction or information; (2) It is delivered to the end user via a computer using a standard internet technology; (3) It focuses on the learning solutions that go beyond the traditional paradigms of training.

According to [2], the term E-learning refers to a wide set of applications and processes, including computer-based learning, web-based learning, virtual classrooms and digital collaboration. It can be defined as the delivery of content via all electronic media, including the Internet, intranets, extranets, satellite broadcast, audio/video tape, interactive TV and CD-ROM. Different approaches to E-learning according to [4] are described in Table 1:

TABLE I. DIFFERENT APPROACHES TO E-LEARNING

Approach	Description
Web based training (WBT)	This is a browser based equivalent to Computer based training, delivered via an intranet or Internet. It's advantage is the ability to deliver dynamic data that can be regularly updated from central location
Web based training plus mentorship	In addition to web-based training, the instructor/mentor is available

	for support via e-mail, chat sessions or the telephone
Synchronous E-learning	Involves the instructor and learners being in the same virtual classroom at the same time. An instructor at a central location leads a group of more than one learner at remote locations via an Internet/Intranet connection. The instructor converses with learners via audio and video
Asynchronous E-learning	This approach includes WBT but also recordings of synchronous sessions, delivered via the Internet on demand. The recordings can be controlled by the learner and replayed at will. This approach has the benefit of being available anywhere and anytime

However, every company has to examine its current state and needs in order to evaluate if E-learning has the potential to enhance employee learning and development programs. From an organizational viewpoint it is necessary to examine the impact E-learning can have on an organization and also ensure that adequate IT, operational and financial resources are available to back up an E-learning initiative.

A. Segments of corporate E-learning

From a corporate viewpoint there are several factors that need to be examined before adopting an E-learning solution which can be decomposed into several key areas. According to [5], a comprehensive E-learning solution includes three key elements:

- Content – intellectual property available in several formats such as text, video, audio, animation and simulation content which can be presented through web-based training courses, online documents, supplementary printed documents, multimedia presentations, video, audio, virtual labs, simulations and animations and tutored training via Internet. It is important for this content to be:

- (1) Delivered timely and updated,
- (2) Accurate, focused on important aspects and in reasonable quantities, and
- (3) Learning materials have to be relevant and according to learners needs.

- Technology – technological infrastructure plays important role in corporate training and enables delivery of content and knowledge through different channels. Four technologies important for corporate E-learning are:

- (1) Computer-based training (CBT) – lectures created using authoring software which enables creation of multimedia mix of different content forms, available for end users on their computer, stand alone training stations and across local area networks.

- (2) Web-based training (WBT) – Wide use of the Internet enabled the transition from CBT to WBT and led to new opportunities for the learners. Corporate education became location and time independent and content could be updated and always available.

- (3) Learning management systems (LMS) – is a software package that enables the management and

delivery of learning content and resources to learners. Most LMS systems are web-based to facilitate "anytime, anywhere" access to learning content and administration. The LMS allows registration of learners, the delivery and tracking of e-learning courses and content, testing, and may also allow the management of instructor-led training classes. In the most comprehensive of LMSs, one may find tools such as competency management, skills-gap analysis, succession planning, certifications, virtual live classes, and resource allocation (venues, rooms, textbooks, instructors, etc.). Most systems allow for learner self-service, facilitating self-enrollment, and access to courses. In corporate environment, LMS contributes to control of learning materials as it has centralized control over it, and to diversity of content for it can contain courses from various providers.

(4) Learning objects – are reusable software components or units of learning material that can be extracted from one course and integrated into another, with the possibility of modification if necessary. The content of these objects is described with metadata element (in Extensible Markup Language format). Thus, they can be defined as collections of information objects assembled using metadata to better fit learner's needs and preferences. They enable flexibility of materials, simple update and content management, customization and interoperability.

- Services – hosting of E-learning software can be done by vendors or Application Service Providers who house or maintain it and the client can access it over the Internet.

IV. E-LEARNING IN TELECOMMUNICATION COMPANIES

Connecting the globe, the telecommunications industry is an essential element of the modern business world. The speed of technological change and volatility within the telecommunications industry requires fast solutions to complex problems. Telecom companies are highly dynamic with constant pressure to sell a more diverse and complex range of solutions than ever before, and to meet and exceed customers' growing expectations. They need to be agile to maintain their competitive edge in the marketplace. This involves adapting to situations and regularly updating strategies, structures and processes. The workforce in the telecom industry today is in such environment in which service and infrastructure innovations are always present.

In such a situation, it is vital for employees to be connected to information constantly and to constantly work on improving their skills and knowledge. In an age of rapidly developing technology, this goal has become increasingly more difficult. The emergence of broadband and wireless technologies poses significant threats to companies relying upon aging infrastructures and outdated marketing strategies. To survive, telecom carriers must consider a number of options, including consolidation, enhanced service offerings, and/or costly technological upgrades.

Rapid technological changes, network security threat and increasing competition are the factors that have influenced organizations in this sector to deploy e-learning

courses on their systems. Most wanted are the engineering trainings in sectors of support, maintaining and managing new installed technologies. Also, demand for proper training in sectors of non-technological areas such as customer care, key account management, sales skills, communication skills, call centre agent training and marketing has increased.

A. Architecture of an E-learning system

System architecture provides an integrated view: a design rationale for functionality, usability, and aesthetics. Understanding the architectural needs of a system requires that designers, developers and end-users effectively communicate and collaborate with each other about the intended goals of the system. This is why all such projects must optimally begin with a Requirements document that clearly defines the intended system processes, functionality, interface, and benefits.

Understanding E-learning architecture allows the system designers and developers to successfully integrate the wide range of E-learning functions that end-users require. By "end-users" we mean all the stakeholders in the system: curriculum sponsors, designers, developers, instructors, authors, content experts, learners - employees, and administrators. An effectively designed system will address the functionality requirements of each category of end-user in terms of what benefits they hope to receive and contribute to the system. Architecture design first involves defining the system in terms of end-user benefit and functionality, and then designing the technology infrastructure and workflows to enable those processes.

Ideally, the system design will be compatible with the following principles:

- Open architecture: support of established industry standards, especially to allow addition of future modules;
- Scalability: so the technical infrastructure can grow in audience size and sophistication;
- Global potential reach: so that E-learning solutions serve the largest base of end-users, with both synchronous and asynchronous distance delivery;
- Integration: seamless front-end and back-end connection to enterprise resources;
- Flexible: open to emerging new technologies and use of new best practices;
- Rapid and timely: complexity of the system is controlled so that the enterprise can reap business benefits quickly.

Logical architecture of an E-learning system can be presented as in Fig. 2:

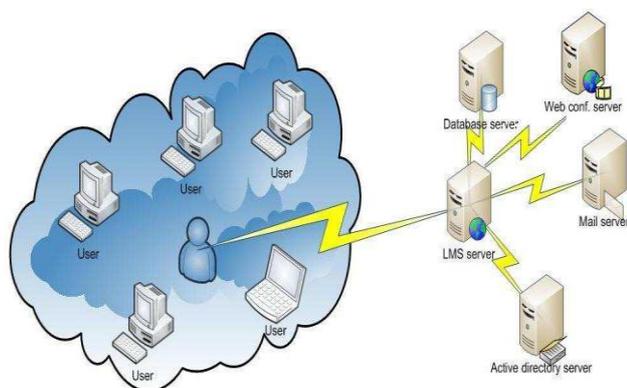


Figure 2. Logical architecture of an E-learning system

The system architecture of E-learning system should ideally be able to integrate the following key functions or services:

Layer 1: User Access — A single entry point allows all users to access all relevant parts of the platform via a standard web browser. An Internet or intranet portal site provides a common access for all users. While some home page news or information pages may be open for anyone to see, entry into the deeper levels of the portal site to participate in web services is restricted by a log-in.

Layer 2: Common Services — These services are needed by every user and are not tied to any particular pedagogic function and include User Management, Collaboration (Synchronous / Asynchronous), Event Management (Calendar / Scheduling / Reminders).

Layer 3: Learning Service — These services provide core functionality for the production and consumption of E-Learning resources. These are LCMS: Content Development (Learning Objects / Aggregation), LMS: Content Delivery (Enroll / Track / Report), Assessment (Test / Score / Evaluation / Surveys).

Layer 4: Databases — This level of infrastructure allows relational databases, typically using SQL, to be interconnected with new XML database technology.

Layer 5: Infrastructure — This level of infrastructure establishes client-server network and physical hardware, utilizing standard internet technology protocols (Internet & Intranet Servers / HTTP / FTP / SMTP / TCP-IP).

V. CONCLUSION

In this time of global market competition, rapid technological advances, demographic changes, and service/knowledge-based economy force, organizations need to educate and constantly train their workforce. Global use of the Internet allows organizations to have new possibilities for delivering and sharing knowledge and education resources. It also brings current, dynamic educational content, and personalized, relevant learning experiences, with ongoing collaboration and communication with experts and mentors. Current main obstacles to e-learning, such as bandwidth, content availability, technology standards, and service integration, are constantly being resolved and upgraded and are not considered being big problem areas much longer.

Although it has taken some time for the business world to understand the benefits of E-learning, it is clear that limitless opportunities are ahead. Employing a successful e-learning strategy allows a corporation to cut costs significantly, while increasing workplace satisfaction and raising employee motivation.

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Comparative Analysis of Quality of Service in Mobile Multimedia Communications in Serbia

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Abstract – This paper seeks to provide some results of measurements that were carried out in mobile communications in Serbia. The choice of relevant Quality of Service (QoS) parameters requires the detailed analysis in order to realize different multimedia applications. Providing of required QoS is one of important elements of design and realization of mobile multimedia networks.

I. INTRODUCTION

The term Quality of Service (QoS) is now widely used in telecommunications. Unfortunately, it is not often clear what it means, which leads sometimes to confusion and mystification.

The reason for the different interpretations of quality of service in telecommunications probably lies in the fact that almost all people are interested in this area - from prominent authors over the equipment manufacturers and to international organizations. For all of them it has become a matter of prestige to have "their" definition and "their" interpretation of QoS, while it was not insisted on the model of consistency, but the differentiation from others. Due to the heterogeneity of network technologies, protocols, terminal platforms, operating systems and applications, situation is exacerbated by the fact that it does not yet exist a telecommunications network which could offer the functionality of QoS from end to end to its users. Therefore, it is not possible to compare the conflicting theoretical approaches to the analysis of "live" network [1].

There has been a tendency in recent years towards unified approach to the phenomenon of QoS in telecommunications networks and the provision of its comprehensive theoretical model.

Diversity in the field of theory of QoS starts from its definition. The most commonly stated definition was given in Recommendation E.800 by the International Telecommunication Union (ITU), by which the QoS is the combined effect of service performances which determine the degree of satisfaction of users of this service [2].

The only complaint that could be imposed would relate to the descriptive character of definition above. The operational "technical" definition could be expected in which the objective categories have to be spoken, with clearly and unambiguously defined measurable parameters that could express the QoS. Instead, we have a "degree of user's satisfaction" as a highly subjective

category. However, the problem has more serious nature. Probably because of the lack of coordination of the activities of the working groups within the Sector for Standards in Telecommunications of ITU recommendations concerning the X series, which are related to networks for data transmission and open systems interconnection, representing also the standards of the International Standards Organization (ISO), QoS is defined as a set of requirements in terms of quality of the collective behavior of one or more objects. The Recommendation X.902 [3] from these series is more recent than the E.800 and I.350, and thus the question can be arisen of whether is ITU de facto revised with its adoption the definition of QoS [4]. Also, in addition to ITU, the rest of the experts clearly put equality between the QoS and network performance.

Equipment manufacturers took advantage of this "useful ambiguity" to highlight "their" definition [1]. Various documents, with more or less propagandistic character, implicitly aim to convince the public that only with the equipment of that manufacturer the functionality of QoS can be implemented. It can be found that the QoS is the ability of the network to provide better service for the given traffic load, or the QoS is capability of the network's elements to offer some guarantees in terms of consistent data transmission. In the first case, it is assumed that a service with QoS support should be better than the "classic" service without its support, although it is not clear where is that improvement. In the second definition, there is confusion by linking the vague phrase of "some level of guarantee" with absolute category of consistent data transmission [5].

This paper is organized as follows. After introduction, a layered model of QoS including its parameters is given. The next section will take quality of experience and its connection to QoS into account. The comparative analysis of QoS in mobile communications in Serbia is also presented before some concluding remarks.

II. LAYERED MODEL OF QUALITY OF SERVICE

The Working Group 17 was established within the ITU-T in order to develop theoretical concepts and definitions related to quality of service in telecommunications. As a result of the work of this group, the Recommendation G.1000 was adopted in 2001. It was shown at its start that the concept of QoS is

now used with a completely wrong or ambiguous meanings. The interpretation of ISO is adopted, where the quality seems a set of characteristics based on the entity's ability to meet the expressed and implied needs. Quality of service in telecommunications is now defined identically as in Recommendation E.800, as the combined effect of service performances which determine the degree of user's satisfaction of that service. This recommendation is reaffirmed through again insisting on the distinction between QoS and network performance.

Recommendation ITU-T G.1000 further defines the framework and approach to QoS, but it can also provide all the components of the functional definition of QoS. G.1000 Recommendation is written as a result of the pursuit of unique QoS approach, with an aim to establish detailed QoS procedures, which can be easily applied to the development and planning, and monitor the QoS that network gives to the user [6]. According to G.1000, the user defines (requires) from the provider of network services certain level of quality that:

- QoS requirements of the users are defined as the level of quality required by an application at user's level, which can be expressed in a manner appropriate to the end user;
- Offered/planned QoS from the service provider is the real level of quality that is expected to be provided to the user;
- Achieved QoS is the actual level of quality that can be achieved and delivered to the user;
- QoS that the user believes that he has is expressed as the quality level for which the user believes that he has been provided by the service provider.

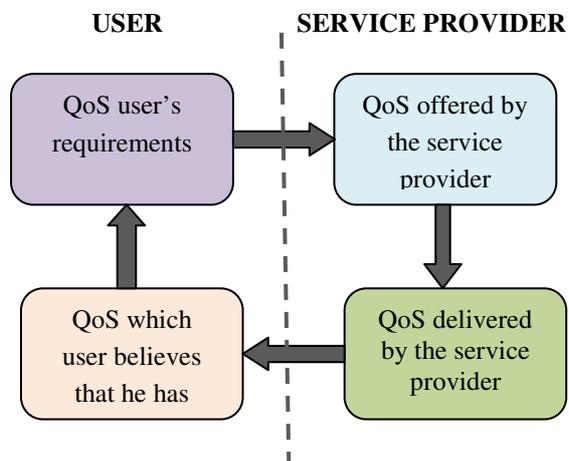


Figure 1. The relationship between the QoS of user and service providers

ITU-T Recommendation G.1010 (QoS multimedia end-user categories) defines key factors that influence the QoS from the perspective of the end user. We have in mind applications that include speech, video, still images, text and data, as well as the parameters that manage the degree of satisfaction of the end user for that applications [7]. In this way, set of QoS classes of different categories of end-user applications is standardized. The aim is that these categories are used as the basis for QoS

performance of real class and some control mechanisms of QoS for the transport networks. The relationship among the levels of quality of these services is shown graphically in Fig. 1. On the other side, a layered model of quality of service is presented in Fig. 2 [8].

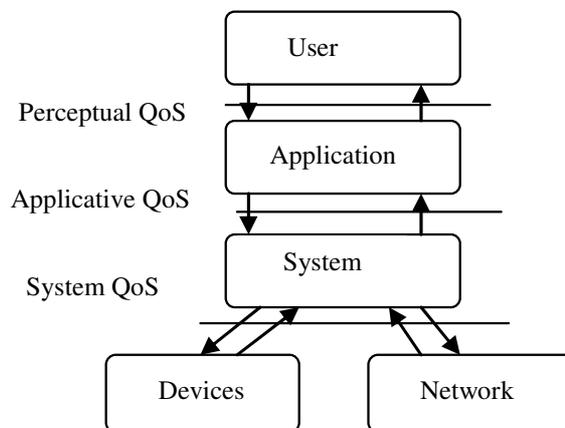


Figure 2. A layered model of quality of service

This model includes different users, applications, terminal system and individual devices necessary to perform services and telecommunications networks.

The perceptual quality of service is defined from the combination of users and applications. It includes description of the QoS perception, such as the quality of the media (eg. excellent, good, poor), the size of video-window (for example, a big screen, small screen), response time (ie. whether it is interactive or background service), degree of protection (eg. high, low) and the requirements in terms of service pricing.

Applicative QoS is defined from a combination of application and terminal system. It includes the description of the quality of the media (eg. resolution and image frequency), the requirements in terms of transmission (eg. delay and delay variation from end to end), the relationship among the media (for example, specifying the synchronization mechanism) and definition of procedures to be taken in case of disturbances in services delivering (eg. if there would be congestion in the network).

System QoS is considered in conjunction with other system terminal devices and network. Here we observe flows, delay, error probability, processing time, buffer capacity, functions of synchronization, error recovery, queuing discipline etc. In the case of devices, such as video card, it is taught about the QoS of the service of the device, which includes requirements for processing power, flow, and timing.

Bearing in mind that the average user of telecommunications services is not technically trained (and indeed does not want to be referred to) in the details of the delivery of services, the question is arised on the way how his basic requirements in terms of perceptual quality can be mapped to specific technical parameters of quality that provider offers. The answer to this question provides Recommendation G.1010, which identifies the key factors that influence the QoS perceived by the user.

These include delay, delay variation and loss of information. The observed numerous applications include voice, video, image and text, for given flow limit and target values of three key parameters of quality. According to the operational importance, this recommendation exceeds far Recommendation G.1000.

III. QUALITY OF EXPERIENCE PARAMETERS IN CONNECTION TO QoS

For each mobile operator it is very important to meet the demands of its customers, in addition to technical requirements, taking into account the user's perception of service quality as an important factor in network optimization. User's perception of QoS indicates to the operator the actual function of the network, regardless of how it is technically realized. Positively or negatively assessed the functioning of the service and/or network is the metric by which the operator is more accurate to describe the Quality of Experience (QoE) - a measure of average user's satisfaction with the service in the network. Loyal customers are satisfied with positive QoE, but also the concurrency of the mobile operator in the environment. Bad QoE in network leads to bad image of operator in the telecommunications market because of customer dissatisfaction and frequent complaints. The most common result is the migration of users to other networks in the region [9].

The measurement of QoE is consisted of observations of different parameters of QoS which the user can notice by using certain services. However, it is important to note that high QoS does not automatically mean imply high QoE. To optimize the network, the goal is to create "universal network", ie. network enough fast, reliable, available all the time that can transmit various types of traffic, and has the characteristics of a minimum delay and packet loss. Mobile networks have characteristics such that it is practically impossible to obtain very high QoS, ie. to fulfill the rule "five nines" (99,999 % availability), as in optical telecommunications. The reason is the signal propagation by air interface, fading, interference, signal inability to cover 100% of the territory, handover and others.

In practice, it is confirmed that although components of the network have very good QoS, the subjective quality of network is not always great, because exactly those parameters whose values at a given time fall below a defined threshold of QoS are going to be superimposed. Therefore, the goal of the operator must be continual increasing the overall QoS in a network on carefully selected QoS parameters of individual services and applications. The direct consequence is to get higher QoE.

In QoE measuring it is necessary first to define the factors that influence the perception of user on specific services, for example number of dropped calls, time delivery of short messages (SMS) and multimedia messages (MMS), availability of the Internet/WAP services, data transmission etc. Since QoE is subjective, it

is important to precisely define and measure all QoS parameters that affect on QoE.

QoE can be measured in two ways:

- By direct examination of customer satisfaction on a representative statistical sample;
- Determining QoE based on QoS parameters, which are obtained from the Network Management System and/or Operations Support System, by observation the value of Key Performance Indicator (KPI) and Key Quality Indicator (KQI).

The first way of QoE measuring is slightly better, because the user's opinion can be quickly get. Because of the dynamically varying parameters in the network, such an analysis should be carried out relatively frequently, which can be complex for users and operators.

Another way to measure is less flexible, but easier for the operator, because the system automatically measures network monitoring. It is important to see the relationship between QoE and QoS KPI/KQI parameters (which alone or in combination demonstrate how system characteristics correspond to the set of requirements for QoS) as well as to adequately express QoE through KPI. The proper selection of KPIs that best describe the state of the network, is the key for good QoE evaluation.

Each KPI does not have the same weight for observed service by determining QoE. For example, good QoE for telephony users means that a call will quickly be made, further the voice quality is as good as in the fixed network and the call is not terminated. Internet browsing requires that image and other multimedia content transmission is fast enough (at least as much as user's patience allows). It is a challenge to establish a high QoE for speech services for the next generation networks, because it is transmitted in packets. QoE is similar to QoS in packet networks, while measurements are made in tracking of packets statistics. Measuring only part of the packet transmission does not give a complete picture of the total traffic in the network [10]. Services prior to the evolution should be classified in groups as follows:

- The type of service (speech, packet data transmission, short messaging, multimedia messaging, video streaming, etc.);
- The type of user (residential or business);
- The popularity of the service.

Popularity indirectly affects the QoE, by showing to the operator which statistical sample should be considered, as well as the type of service for the network optimization and planning. Other factors that may affect the user's perception of services include the external environment in which is the user establishes the call/session, level of his technical expertise and knowledge of the used technology, age and so on. Because the operator has no influence on these factors, they can be taken into consideration in network optimizing in terms of services adaptation and user's applications so that they are more intuitive and easier to use. The result of these actions also contributes to a high QoE.

QoE values are expressed numerically with gradation scale from 1 to 3 (coarse metric) or 1 to 5 (finer metric). The value of 1 means the worst user's service quality evaluation, while 5 is the best. Some services can be evaluated with "work/not work", ie. with only two values, while the other services are gradually evaluated on the basis of observed quality - rate on a scale of 1 to 5. It is necessary to create an algorithm that assesses QoE and/or calculates from the measured QoS KPI/KQI values. The time required to perform a transaction, delay, bit stream, the number of successful and unsuccessful calls and/or sessions is mapped into a subjective scale. The algorithm should generate QoE values based on the different percentage share of measured KPI/KQI values. Total and medium KPI/KQI values and KPI/KQI value at the time of peak workloads have different importance in the evaluation of QoE, as they carry different information about user's behavior in the network during the observation period.

Mapping of several important QoS KPI/KQI parameters versus QoE are given in Table 1. The general parameters that do not depend on transfer technology are given.

TABLE 1. MAPPING OF QoS KPI/KQI INTO QoE

QoS KPI/KQI	QoE
Service availability	Service available/ non available
Estimation of dropped call /session	Service operates without / with problems
Duration of call/session establishment	Duration of call/session establishment
Repeating and data buffering in transmission	Buffering during transmission
Quality of speech and sound	Quality of speech and sound
Quality of video signal in frame	Deadlock in image transmission, noise on image edges, image clarity, color reproduction
Quality of video signal in frame stream	Continuity of successive images, image freezing
Audio/video synchronization	Audio/video synchronization

IV. COMPARATIVE ANALYSIS OF QUALITY OF SERVICE IN MOBILE NETWORKS IN SERBIA

The measurements considering QoS of all mobile operators were carried out on the territory of the Republic of Serbia in the period from 16. September 2011 to 14. October 2011 [11]. The purpose of the measurements was presenting relevant information to the public.

The measurement was carried out with the autonomous system *TEMS Automatic*, by manufacturer ASCOM, and it was handled by a team of engineers for optimization and quality of Vip mobile operator.

Equipment consisted of three identical, independent radiotesting units (RTU), each of which was used to measure the quality of an operator: MTS, Telenor and Vip. In each unit there were two SIM cards of corresponding mobile operator - a SIM card was used to measure the quality of voice service, and the other to measure the quality of data transmission.

Measurements of the quality of service of operators are designed to simulate as closely as possible the behavior of users. Lists of tasks were defined to be carried out in a single measurement activity, independently for voice service and data service. In the case of testing of voice service the task list was consisted of dialing a number from the fixed network, and then receiving a call from the same number, associated with the stationary part of the system TEMS Automatic. Calls lasted hundred seconds, which corresponds to an average length of calls in Serbia. List of tasks to test the quality of data included five consecutive tests of network response, so-called ping testing, then FTP download of file size of 3 MB, which corresponds to downloading of average mp3 files from the Internet, and at the end the FTP upload of file of 1 MB, which corresponds to the average size for sending the photos.

Measurements were carried out on the territory of seventeen largest cities in Serbia: Belgrade, Novi Sad, Niš, Kragujevac, Subotica, Zrenjanin, Pančevo, Čačak, Leskovac, Smederevo, Valjevo, Kraljevo, Kruševac, Šabac, Vranje, Užice and Sombor. According to the census from 2002, 33,1% of the total population of Serbia live in these seventeen cities, which is large enough to represent the QoS of mobile operators. In addition to these cities, the measurements included all major highways, roads and important access roads to some of the larger cities. Measurements carried out in the cities combined driving and rest, while tests performed on the road were only in movement. Routes are carefully chosen so that all city parts were taken into account, so that the quality performance was about as exact as possible. The map of measured routes is shown in Fig. 3.



Figure 3. Map of measured routes

The results of measurements that are carried out are presented in Tables 2, 3, 4, 5, 6 and 7.

TABLE 2. RESULT OF MEASUREMENT - VIP VOICE SERVICE

Average PESQ (Perceptual Evaluation of Speech Quality)	Blocked calls [%]	Interrupted calls [%]	Time of establishment [s]	Success of handover [%]	
VIP					
Serbia	3,90	1,23	0,44	3,69	99,51
Niš	3,93	0,00	0,00	3,51	100,00
Novi Sad	3,90	1,52	0,00	3,67	100,00
Beograd	3,94	1,19	0,48	3,65	100,00
Kragujevac	3,89	0,00	0,00	4,09	98,11
Other cities and roads	3,88	1,33	0,55	3,69	99,45

TABLE 3. RESULT OF MEASUREMENT - TELENOR VOICE SERVICE

Average PESQ	Blocked calls [%]	Interrupted calls [%]	Time of establishment [s]	Success of handover [%]	
TELENOR					
Serbia	3,90	1,60	0,49	3,31	97,52
Niš	3,81	1,69	0,00	3,53	10,00
Novi Sad	3,92	2,14	0,55	3,14	98,59
Beograd	3,89	0,73	1,23	3,14	99,43
Kragujevac	3,90	6,78	0,00	3,39	96,97
Other cities and roads	3,91	1,55	0,27	3,38	96,65

TABLE 4. RESULT OF MEASUREMENT - M:TS VOICE SERVICE

Average PESQ	Blocked calls [%]	Interrupted calls [%]	Time of establishment [s]	Success of handover [%]	
m:ts					
Serbia	3,83	2,03	0,65	4,01	98,93
Niš	3,81	0,00	1,72	4,13	100,00
Novi Sad	3,84	4,71	2,75	4,06	97,25

V. CONCLUSION

With permanent increase in applications and the rapid development of telecommunications it is realistic to expect an increase of users and their demands for services. Multimedia communications services are now the most widely used form of communications, and that new

services require guaranteed quality, network protocols and corresponding high intensity traffic. A good understanding of service quality and its application are the basis of successful service. In order to form a precise model of quality service, and to manage quality services, it is necessary that the parameters describing the quality of the intensity of traffic from the standpoint of equipment manufacturers, service providers and users are selected so that they can be quantitatively and qualitatively evaluated and interconnected.

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TABLE 5. RESULT OF MEASUREMENT - VIP DATA TRANSMISSION

Average FTP stream – DL direction [Mb/s]	Average FTP stream – UL direction [Mb/s]	Average response time [ms]	Interruption of data sessions [%]	Access time to data services [s]	Duration of data session [s]
VIP					
Serbia	5,983	2,053	100	4,23	11,67
Niš	5,738	2,163	55	1,33	5,46
Novi Sad	5,402	1,921	94	2,30	5,56
Beograd	6,610	2,257	67	1,19	4,59
Kragujevac	6,350	2,048	184	2,70	5,00
Other cities and roads	5,802	1,978	115	6,32	17,04

TABLE 6. RESULT OF MEASUREMENT - TELENOR DATA TRANSMISSION

Average FTP stream – DL direction [Mb/s]	Average FTP stream – UL direction [Mb/s]	Average response time [ms]	Interruption of data sessions [%]	Access time to data services [s]	Duration of data session [s]
TELENOR					
Serbia	4,507	1,389	145	2,04	14,03
Niš	2,407	0,283	153	1,83	21,16
Novi Sad	4,662	1,798	161	2,29	8,29
Beograd	5,966	2,122	62	2,22	4,99
Kragujevac	2,640	0,282	204	1,74	22,77
Other cities and roads	4,019	1,092	176	1,94	18,44

TABLE 7. RESULT OF MEASUREMENT - MT:S DATA TRANSMISSION

Average FTP stream – DL direction [Mb/s]	Average FTP stream – UL direction [Mb/s]	Average response time [ms]	Interruption of data sessions [%]	Access time to data services [s]	Duration of data session [s]
m:ts					
Serbia	1,642	0,452	355	1,55	22,27
Niš	1,753	0,684	164	0,71	15,43
Novi Sad	1,697	0,428	457	3,00	21,38
Beograd	1,680	0,330	379	2,29	26,16
Kragujevac	1,443	0,418	274	0,94	24,48
Other cities and roads	1,624	0,480	346	1,18	21,52

Using AHP Method and Expert Choice Software for Deciding on Solar Collector Products

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Abstract - Selecting a solar energy collector with optimal characteristics is a common problem in practice. The choice is often based on the personal feeling of decision maker. The consequence is that the choice is not always optimal. In this paper is presented an approach for selecting a solar energy collector with optimal characteristics based on AHP method. The analysis includes the physical, constructional, and economic parameters. The criteria are established based on the analyzes, and after that with the help of a software tool Expert Choice was selected a solar collector with optimal characteristics.

I. INTRODUCTION

The energy of solar radiation, which comes to the Earth yearly, is around 170 times bigger than the energy contained in the overall reserves of coal in the world. The capacity of solar radiation on Earth is, according to some estimation, around 14.000 times bigger than the overall energy consumed by human kind today. The power of solar radiation that falls onto the Earth is around 175.000 TW [1]. What kind of a potential is that, shows also the fact that entire world energy consumption has the power of closely 13 TW! The energy of solar radiation that reaches the Earth's surface, meaning potentially usable solar radiation, is around $1,9 \times 10^8$ TWh (190 million of TWh) yearly. This energy is around 170 times bigger than the energy of entire coal reserves in the world and compared to the needs of human kind for energy, that is $1,3 \times 10^5$ TWh (130 thousand TWh) yearly, we come to a derivational fact that the solar energy that reaches the Earth during only 6 hours is enough to satisfy all needs in the world on annual level. To get a better insight for these values, an average household in some of the most developed countries in the world spends yearly around 10.000 kWh of electricity, and it would take 100.000 years to spend 1 TWh. Around 37 % of global demand for energy is satisfied with production of electricity which in 2008 was around 17.000 TWh.

In practise, selection of Receiver of Solar Energy (RSE) remits for personal judgement of an engineer [2]. That choice is often inadequate. Generating and identifying of alternatives in decision making process, and selecting and constructing of attributes is usually subjective choice of decision maker. Buchanan et al. argued that it is possible and necessary to understand where and how objective measures should be replaced by

subjective measures and judgments in the decision making process [3]. With tendency to gratify a demands of investor, quite often the choice is RSE with the lowest price. Criteria like overall area, absorb area, absorb of Sun radiation, price, mass, and warranty affects the priority of multiple alternatives. Making the most objective decision can be assisted with various methods and tools. In this paper, the decision related to selecting the optimal RSE is supported with Analytical Hierarchy Process (AHP) method and Expert Choice software tool.

The rest of the paper is structured as follows. The second section provides an overview of AHP, while the third section provides short overview of software support for decision making. The main part of the paper, with presented results and discussion is the fourth section. Conclusions and further research directions are in the last section of the paper.

II. ANALYTICAL HIERARCHY PROCESS (AHP) METHOD

Decision-making is usually related to setting priorities and choosing alternatives based on multiple criteria. For making appropriate decision, the decision maker should have a fixed set of criteria and a clear picture of all available alternatives. Decision-making involves individual or groups that may cooperate to make decisions. Decision maker values and preferences greatly impact the process of identifying and choosing among the alternatives. Several methods have been developed for determining the ranking of a set of alternatives in terms of a set of decision criteria [4]. Decision theory is widely used in industrial engineering. The most common application of decision-making techniques in industrial engineering is in the fields such as the evaluation of technology investment, flexible-manufacturing systems, and capacity planning in manufacturing systems, advanced technology adoption, and many other engineering problems.

Saaty developed the Analytic Hierarchy Process (AHP) [5]. AHP is a multi-criteria decision-making method that allows the decision maker to assess the relative weight of multiple criteria or multiple options. AHP allows integration both quantitative and qualitative aspects of decision-making, which makes it an efficient and effective method, applicable in complex contexts. In the core of the AHP is the use of pairwise comparisons for elaborating a ratio scale. Pairwise comparisons is based on

comparing a pair of elements on a single property without concerning other properties or other element [6].

The AHP uses a hierarchical model for the decision problem. This hierarchical model consists of an overall goal, a group of alternatives, and a group of criteria for ranking alternatives to the goal. AHP analysis can be implemented in the practice as a stand-alone technique, or in combination with other analysis techniques. The basic procedure for conducting the AHP method consists of the following steps:

- *Structuring a decision problem and selecting criteria.* This hierarchical structure comprises three levels (see Figure 1.): a goal is at the topmost level, criteria and sub-criteria are at the intermediate level, and options are at the lowest level.
- *Using pairwise comparison for priority setting of the criteria* (weighing). For each pair of criteria it is necessary to determine their relative importance.
- *Pairwise comparison of options on each criterion* (scoring). Comparisons of elements in pairs are possible if they are close with respect to the common attribute.
- *Obtaining an overall relative score for each option.* The overall score for each option is based on combination of option scores and the criterion weights.

Poh and Ang [7] presented a study of alternative fuels for land transportation in Singapore. Analysis started with more than 10 possible fuels that might be used. A simple multiple attribute analysis is used to reduce the number of fuels to four options. Evaluation of four possible scenarios is performed by using AHP analysis. Analysis was based on multiple attributes with the aim to identify fuel options for possible use.

Chang et al. [8] discussed and developed a manufacturing quality yield model for forecasting 12 in. silicon wafer slicing that can be used in semiconductor industry. The authors used AHP algorithm for evaluating three kinds of cutting machines and identify the machine with the optimum precision, and later sensitivity analysis for testing the stability of the priority ranking.

Vidal et al. [9] elaborated an AHP-based methodology and measure to evaluate relative project complexity. Defined project complexity measure can assist in decision-making. Complexity scales and subscales highlight the most complex alternatives and their principal sources of complexity. The set of criteria and sub-criteria exists in the hierarchical structure. In order to validate their approach, the authors conducted a case study with a start-up firm in the entertainment industry.

In the article [10] were evaluated the main existing collection technologies in India for solar thermal power using the AHP framework. The study is a part of the project that aims to construct and test a solar power plant in India. The critical factor for constructing a plant is the correct selection of the solar collector technology. The

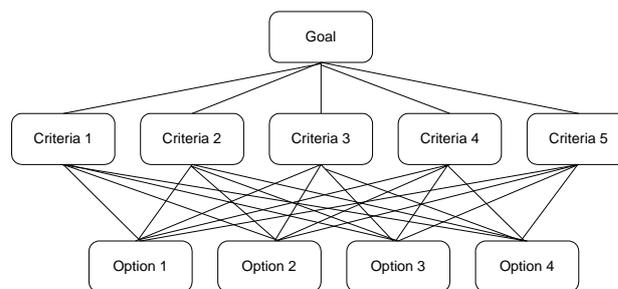


Figure 1. The hierarchical structure in AHP method

evaluation criteria were classified as technical, economic and environmental.

III. SOFTWARE SUPPORT TOOL: EXPERT CHOICE

Software tools for decision-making help individuals or organizations with their decision-making process. The help is usually in the form of ranking, sorting or choosing from among alternatives. Most of software tools are spreadsheet based, with the introduction of web-based tools in the mid-1990s. Advances in information technology have made designing interactive and user-friendly decision support software systems feasible.

Expert Choice software helps decision makers in structuring a decision into smaller parts. It enables proceeding from the goal to objectives and to sub-objectives, and down to the alternatives for the actions. Decisions are based on simple pairwise comparison judgments throughout the created hierarchy to arrive at overall priorities for the alternatives. The decision problem may involve several different factors that are related to various aspects of the decision problem, such as social, political, technical, and economic factors.

Expert Choice helps in solving all tasks in decision-related studies, such as problem modelling, pairwise comparisons, judgment scales, derivation methods, consistency indices, synthesis of the weights and sensitivity analysis [11]. Expert Choice is intuitive, graphically based and user-friendly software tool valuable for conceptual and analytical thinkers. It is easy to comprehend by both novices and experts. Expert Choice allows you to enter personal subjective judgments in numerical, graphical, or verbal modes, where each judgment expresses the ratio of one element compared to another element [12].

IV. RESULTS AND DISCUSSIONS

The analysis included five collectors from different manufacturers, with different characteristics. To make it easier opted for a particular type of solar collector is applied AHP method of multi selection mode. The criteria by which to determine the final alternative of targets are given in Table I.

Software tool Expert Choice was used in this research for solving the problem of multi-criteria choosing of a solar collector with optimal characteristics. It also enables sorting priorities and evaluating alternatives. Particularly helpful is visualization of the sensitivity analysis, which is

based on a simple interactive mode of changing weights of the criteria and alternatives. In this research, Expert Choice tool is used to perform the following analyses:

- Sensitivity analysis of performance,
- Dynamic sensitivity analysis,
- Gradient sensitivity analysis and
- Comparative analysis (head to head).

criteria to the current and total comparison. Current comparison of alternatives is a change in priorities of alternatives, influenced by the weight of one criterion. Total comparison of alternatives is a comparison of the same weight under the influence of the criteria taken into the analysis. Completed analysis shows that the alternative *Manufacturer 3* is positively influenced by the masses and especially the guarantee criteria. Criteria such as prices and absorption of solar radiation negatively affect the

TABLE I. THE CRITERIA THAT DETERMINE THE FINAL ALTERNATIVE TARGET

Manufacturer Criteria	Total surface (m ²)	Absorbing surface (m ²)	Absorption of solar radiation (%)	Mass (kg)	Price (€)	Guarantee (year)
Manufacturer 1	2.14	2	95	36	290	2
Manufacturer 2	1.79	1.62	95	34	255	2
Manufacturer 3	1.86	2	95	49	250	25
Manufacturer 4	2.17	1.94	94	45	330	2
Manufacturer 5	2.03	1.76	95	37	360	12

The problem is set up as a hierarchy through the alternative *Manufacturer 3*.

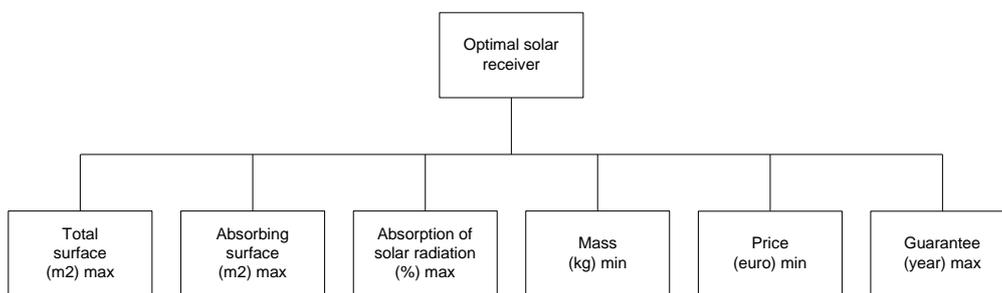


Figure 2. The hierarchy of the problem

levels, as it is presented in Figure 2.

A. Sensitivity Analysis of Performance

Results of analysis sensitivity performance show the importance of action according to each criterion separately and importance of action by all criteria together. With this analysis can be seen all intermediate and final results. Graphical display of performance sensitivity analysis, presented in Figure 3., shows the effects of a certain

B. Dynamic sensitivity analysis

Dynamic sensitivity analysis shows how a change in importance (weight) of one criterion affects the action. By changing the weight of one criterion, automatically is changing the weight and other criteria. In the basic view is the original solution without correction (Figure 4). Dynamic analyses results show how dynamically change the priorities of alternatives at different weight of

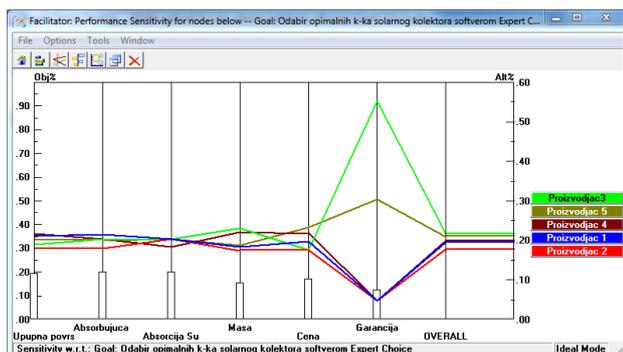


Figure 3. Graphical representation of sensitivity analysis performance

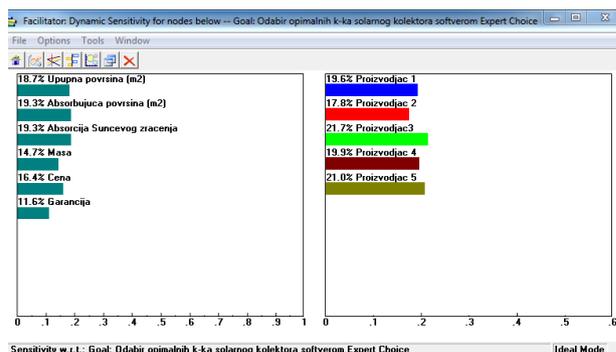


Figure 4. Graphical representation of sensitivity analysis performance

individual criteria. This view allows look at the overall share of the weights of individual criteria in the overall priority of alternatives. If we change the weight of one criterion, other weights change proportional to the initial weight criteria. Criteria: absorbing surfaces and absorption of solar radiation has a share of 19.3% - which means that these two criteria are priority.

In the event that there is a need for a change of criteria, it can be done by the right to view the desired weight criteria can be changed by pressing the mouse button on the desired criteria and pulling in the right direction.

C. Gradient sensitivity analysis

Gradient sensitivity analysis is presented in a graphical representation of the dynamic sensitivity analysis for each criteria (Figure 5). On the coordinate axis shows the observed weight criteria, and on the ordinate actions are priorities depending on the weight of criteria. The line L1 represents the ranks of the action for the observed weight of observed criteria.

D. Comparative analysis (head to head)

Comparative analysis (head to head) shows the comparative presented alternatives. In view of default criteria different alternatives affect on the final result of the sensitivity. In Figure 6 are presented alternatives P1 i P2. Mutual qualitative relationship between two alternatives is shown in bar chart histogram. If one alternative is better than the other, then the surface of the bar chart illustrated to show how this alternative is better. Information about which alternative is better represented by the spatial position of the bar chart. If the bar chart on the left side shows an alternative P1, then the alternative P1 is better than P2 alternative with regard to certain criteria. In that way, alternative P1 compared to P2 is better alternative on the criterion of total area, as indicated by the blue area. Like the other criteria are also sympathetic to the alternative P1, so that both the bar chart are displayed on the left side.

This analysis can be done for all couples, and usually is done for two of the best actions with close priorities.

V. CONCLUSIONS

In this paper is presented the usage of software tool Expert Choice for AHP analysis. AHP analysis is performed with the aim to help in deciding on the particular solar collector product. The choice is between products from different manufacturers, while for decision were used multiple criteria. The analysis include analysis of the sensitivity performance, dynamic analysis of sensitivity, analysis of the sensitivity gradient and a comparative analysis (head to head).

Completed od AHP analysis shows, that, taking into account the predefined criteria as the best manufacturer is selected *Manufacturer 3*. Choosing the best features of RSE is very important. The result of selecting the most optimal characteristics of RSE is a positive result, for example higher energy efficiency of the entire solar system. Selecting the type of RSE in this manner may, for example, influence the price of the solar system, but these

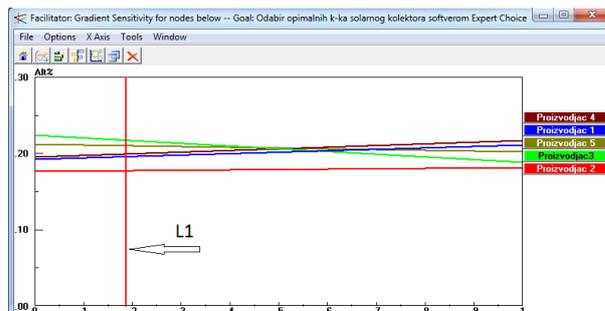


Figure 5. Graphical representation of sensitivity analysis performance

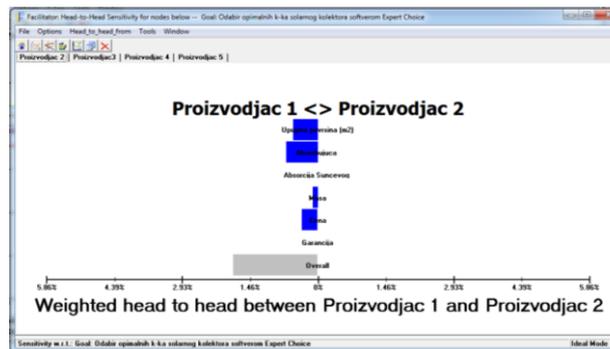


Figure 6. Graphic representation of comparative analysis (head to head)

higher energy efficiency investment quickly pays off. Failure of this method is a subjective method of selection criteria for this analysis if the person is not competent to do so.

Further research will be pursued in the following directions:

- Increasing the number of criteria, based on expert analysis of the parameters relevant to enhancing energy efficiency as the final target.
- Using other methods for decision-making (for example *Simple multi-attribute rating technique - SMART*) in this context and comparing the results with the results obtained with AHP.

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Visualization of Volumetric Models Obtained by Optical 3D Digitizing on Mobile Computing Platforms

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Abstract - The fundamental purpose of a volumetric model is to describe a physical object's geometry definition in a precise and clear way with no risk of misinterpretation or assumption. Quick visualization of 3D models is necessary in different areas. Internet and available computational platforms are suitable for presenting and sharing of volumetric models. Widespread of mobile devices like tablets and smartphones provides suitable platform to enable development of rapid visualization of different types of models on mobile computing devices. This paper describes proposed platform and shows that is suitable and efficient in model visualization. The presented technique is useful for general volume models although it is mainly used for presenting 3D digitized parts. The QR codes are implemented as mobile-readable URLs for comfortable use. The indicated models are then downloaded from the Internet and displayed on the user's phone. The files can be smoothly rotated and zoomed using touch gestures.

I. INTRODUCTION

In many business and scientific applications is extremely important to effectively and quickly display the 3D model [1]. Likewise, presentation of volume models through internet becomes more and more useful. While today's technology offers new computing solutions, there is need for new expertise to unite the 3D model generation (particularly 3D digitization), networking, web services, and client side application portions of the solution.

Smartphone and Android [2] open even more possibilities. A smartphone is a mobile phone built on a mobile computing platform, combining the functions of a mobile phone, personal digital assistant (PDA), low-end compact digital cameras, portable media players, and GPS navigation units. Modern smartphones typically also include high-resolution touchscreens, web browsers that can access and properly display standard web pages rather than just mobile-optimized sites, and high-speed data access via Wi-Fi and mobile broadband. Android is a software stack for mobile devices that includes an operating system, middleware and applications. Android supports the execution of native applications and a preemptive multitasking capability. It is also possible to install third-party applications.

In this paper, a procedure for generating 3D display on a user's smartphone is presented. In parallel with the visualization techniques are becoming faster and faster,

the size of datasets also increases. The procedure for generating the model having the minimum size for quick transfer over the Internet and instant preview generation is described.

II. MODELS' DEVELOPMENT

In order to preview the model over the Internet and provide their free download high, medium and low resolution volumetric watertight model are developed. In the following text a minimal processing pipeline is described.

A. Optical 3D digitizing

3D scanners accurately scan/capture the surface visible to sensor of objects and provide real 3D data [3]. Scanning of 3D shape was performed by using optical device GOM ATOS IIe 3D Scanner [1], [4], [5]. The ATOS is a high-end industrial 3D digitizer, mostly used for three-dimensional measurements, inspection, and reverse engineering. The scanner consists of a compact housing, provided with projector and twin 2.0 megapixel CCD image sensors, Fig. 1. The surface of the object is focused through the lens and captured by the CCD inside the 3D scanner. It can be mounted on a stand or on a robot for automated measurements. It uses a proprietary platform, called ATOS V602 which runs on GOM Linux, extension of SUSE Linux distribution. This software, although necessary for the acquisition, is suitable for the alignment of the meshes of complex objects.

Active imaging 3D scanning works by the principle of triangulation [6-8]. High level of detail and accuracy is obtained by using structured light scanning technology. By making a triangle between the scanner lens, projector, and point on object being scanned accurate 3D data can be obtained. The distance between the 3D scanner lens and the projector (parallax base) is known and with the given angle between the projector and camera, all of the information is provided to obtain spatial coordinates of the object's surface.

Overall scanning process with the ATOS IIe system covers following phases: (a) calibration, (b) preparation and setting of device, (c) preparation and setting of measurement object, (d) measurement/scanning (Fig. 2), (e) processing of measured/scanned data, and (f) post-processing (processing of results).

Before any digitization is carried out, calibration of digitizer is performed. Calibration is a phase of measuring process during which the measuring system with or without the help of calibration objects is adjusted such that the dimensional consistency of the measuring system is ensured. A prerequisite for successful calibration is the

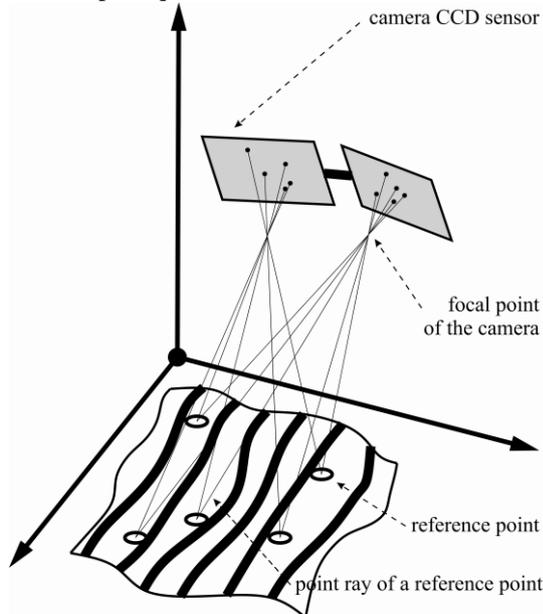


Figure 6. Active imaging 3D scanning



Figure 7. Digitizing of model with high-end industrial 3D scanner ATOS

correct setup of the sensor. For the given sensor configuration there is calibration object required for the corresponding measuring volume. As calibration object for this measurement calibration panel is used. Calibration panel has two scale bars, which is the specified distance between two specific points. In order to capture the entire measuring volume, the sensor and/or calibration object are moved during calibration in each case starting from the center of the measuring volume. At the end of the calibration process, the software displays the calibration results. For a good calibration, the calibration deviation needs to be between 0.01 and 0.04 pixels.

A figure 2 shows the model scanning process: model being digitized is fixed, while the ATOS IIe was used to extract the geometrical data by moving its sensor across the model. Structured-light 3D scanners projects white light fringe patterns on an object surface. The line is projected onto the subject using an LCD projector. The deformations of the pattern are captured by two measurement cameras. In other words, camera looks at the shape of the line and uses triangulation to calculate the distance of every point on the line. In the case of a single-line pattern, the line is swept across the field of view to gather distance information one strip at a time.

Complex geometries of the measuring object are digitized through sufficient number of individual measurements. In order to digitize specific part of free-form 3D surface, at least one measurement is required. The surface has to be visible in both cameras of the measuring system. Overlapping of individual measurements is being performed using reference objects placed in the measuring volume.

In order to transform individual measurements in the same coordinate system alignment was performed using an Iterative Closest Point (ICP) algorithm. The ICP algorithm is widely used for geometric alignment of three-dimensional models when an initial estimate of the relative pose is known. The algorithm is commonly used in real-time. It iteratively revises the rigid-body transformation (translation and rotation) needed to minimize the distance between the points of two raw scans. Alignment is mostly characterized by two main steps: the first one consists of the identification of homologues points; the second step is represented by the automatic alignment, until the average distance between the two range maps is minimized.

Complex geometry is scanned in two measuring project: first project deals with the top half of the model, and second project deals with the bottom half of the model. Measurement projects are connected through common uncoded reference points that are available (visible) in both projects.

A dense point cloud is then produced through software. The point cloud represents the digital model of the scanned object. Some points appear as a result of non-proper calibration of digitizer, vibrations during the scanning process or improper preparation of surfaces of scanned objects. Also, concentration of points appears on the places of sharp edges. Inaccessible surfaces as well as reflection cause the loss of number of points. Processing of point cloud means optimization and reduction of

number of points on the one side and preservation of representativeness of points on the other side. Non-representative points and points of discontinuous are removed. Polygonization process is then performed. The result is a detailed triangulated mesh, i.e. the 3D model is expressed as an assembly of polygons. The obtained models are registered into the appropriate coordinate system. Figure 2 shows the volume rendering for randomly selected digitized model.

B. Models' decimation

All aspect of data size has been considered by using a segmentation and simplification scheme and server-side data management to keep transmission size to a minimum, thus improving view generation time. Simplification and segmentation procedures are applied to the original volumetric model to provide the user with full web access to complex 3D models. Using decimation the number of triangles is reduced without derogation of consistency and topology. The former is aimed to decrease the size of the data being transmitted over the Internet. The scan data have been processed in MeshLab [9]. Models are imported into the software as STL files and after processing the exported files are also STL. MeshLab is an open source program for aligning, merging, cleaning up and simplifying scanned meshes. A wide range of filters were applied to clean and repair each range map (Remove duplicated face, Remove duplicated vertex, Remove isolated pieces, Self Intersecting face, etc.). MeshLab has full import/export capabilities and python scripting support, which are useful for automation of the processes. Because certain processes need to be repeated this property is very useful.

After all the post processing steps the 3D high definition models are generated. Deviation field of decimated model in reference to full resolution model is generated in software ATOS. Maximum deviations are negligible and do not affect the display quality (Fig. 4.). Although it was possible to decimate the model significantly, the big amount of triangles was preserved in order to save the high quality and details of the object. Nevertheless, preview model via Internet is enabled through the model with a low resolution so that the users with lower connection bandwidth can comfortably use the portal. All models have size up to 200 kb. These models are downloaded and showed in less than a second.

C. Web application development

During the development of applications, intention is to enable users to use digitized content [10]. In this sense, the interaction between users and the applications is enabled using smartphone. We build and host a website to host the content and deliver content to mobile computing platforms (Fig. 5.).

Comfortable for users of mobile platforms, models are available via Quick Response (QR) codes as they are a great tool for linking information to locations and objects (Fig. 6). QR codes are two-dimensional barcodes (matrix codes) that allow their contents to be decoded at high speed. QR codes linking online resources and allowing user interaction. They also are very cheap to produce.

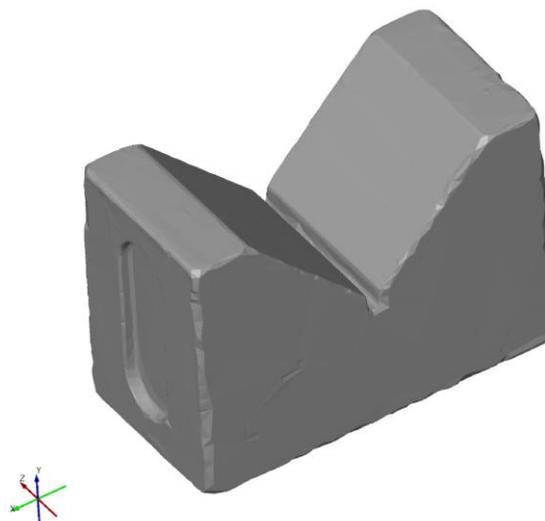


Figure 5. Randomly selected digitized 3D model

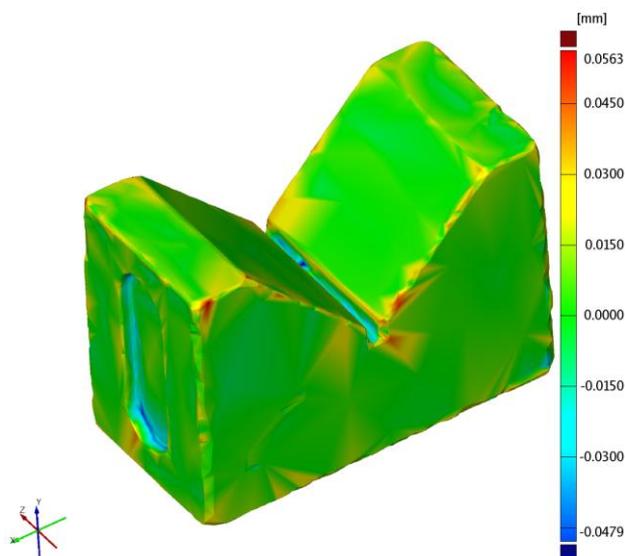


Figure 4. Deviation field of decimated model in reference to full resolution model

There are a number of freely available QR code generators including Kaywa [11] and i-nigma [12].

Using the QR code requires the existence of the application to process QR code and display the models on the users' phone. Integrating already developed software available on the Google Play [13], we suggest a platform that is used to display digitized 3D models. In terms of software that are needed on the user side (on user Smartphone), we distinguish between software that reads the QR code and software which generates 3D polygonized mesh preview. For both groups of the software, several programs that can be freely downloaded from Google Play were tested. Thanks to the many positive attributes, as well as overall aesthetic impression, users are advised to use Carpet One QR Scanner and STLDroid.

D. The use of proposed platform

The process of content reviewing starts running applications to read and decode QR codes. The application

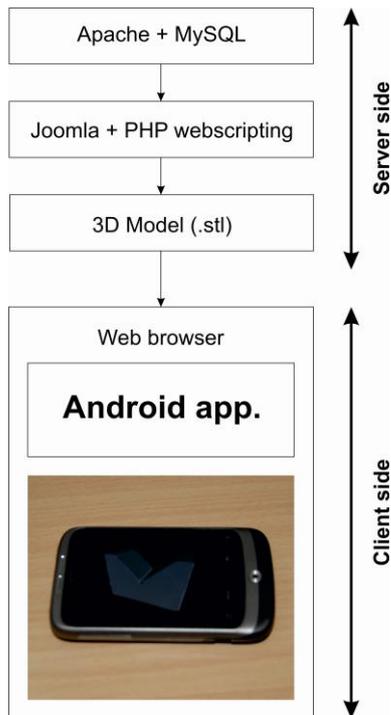


Figure 6. Architecture of web application



Figure 7. Example of QR code

through the built-in camera reads QR code placed close to the object. Based on the code the web link to a 3D model is generated by the same software. Link is passed to the native web browser, which through HTTP request asks for server if there is file on specified location. Server returns HTTP response, and via native web browser is passed to the software for preview of desired 3D model. Parsing of STL file is starting, after whole STL model is via internet loaded into software, showing binary or ASCII STL files. Server host binary files and the size of data to be transmitted to the user device are very small. Also, all models can be saved in bookmark for later re-inspection. Mobile devices can also serve as USB stick memory, so it is possible offline working with models for users with internet access. The loaded model can be smoothly rotated and zoomed using touch gestures.

III. CONCLUSION

In this paper a method for presenting of volume models is described. We show that our method is effective and easy to incorporate in existing web platforms. The main advantage of our method is that it gives the results in a time comparable to loading a model, and thus, the user can immediately begin the inspection starting from a good view of the model.

Presented objects become personal; they can individually be zoomed, rotated and animated. The user has the specific model virtual in his hand and can explore the model interactive and personalized. The game and control instinct brings an enhanced interest for the product.

Due to the fact that the developed models are freely available on the Internet and cheap open-source and open-hardware 3D printers are appeared, it is certain that in the near future these models will be printed and widely used.

This method is useful, as it allows a user to obtain representative views in a short time, comparable to the loading time of the dataset. An inherent weakness of proposed platform is that as model complexity increases quick 3D viewing suffers, especially on low cost platforms.

ACKNOWLEDGMENT

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Remote Visualization of Finite Element Calculation Results in Vascular Interventions Decision Making

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Abstract - Paper presents an overview of software platform used by cardiologist in remote visualization of finite element calculation results in order to study of blood flow in human carotid arteries. Finite element solver PAK-F is used for the calculation of viscous fluid flow. Thus, governing equations of fluid flow are presented. The geometry of carotid artery bifurcation is obtained through the reconstruction based on images from CT scanner. Simulation of blood flow through the carotid artery bifurcation is conducted on a realistic three-dimensional patient-specific geometry. Developed software platform is tool which can give useful on site inputs to cardiologists. They determines if some cardiac intervention is required and in which moment of plaque development.

I. INTRODUCTION

Atherosclerosis is one of the most widespread diseases that affecting blood vessels in the human body. Artery bifurcations are among the most frequent site affected by atherosclerosis, being involved in up to 20% of percutaneous interventions. Several studies on the distribution of atherosclerotic plaques in human arterial systems have shown that atherosclerosis occurs predominantly at certain location of the vascular tree where the arteries have relatively complex geometry that result in disturbed blood flow behavior. In these regions, complex hemodynamic conditions dictate the localization and progression of atheroma. The studies [1-4] shows that very responsible flow-related hemodynamic factor affecting the distribution of atherosclerosis are low or reversed wall shear stress. Computational fluid dynamics (CFD) is an area of fluid dynamics that can be applied to study the hemodynamic factors in human body. Over the years, mathematical modeling, has established as a complementary to experimental approach in investigating clinical problems as well as predicting the biomechanical behavior. The results of the finite element models may be trusted if they take into account all impacts, including the actual geometry of the domain. In other words, anthropometric variability of size and shape should not be neglected.

This paper presents a very effective methodology for remote visualization of finite element calculation results via internet. The main intention procedure generates

valuable inputs to cardiologists in planning further treatment of patients with cardiac and vascular diseases.

II. METHODS

A. Basic equations of incompressible viscous fluid flow

Differential equations that govern the blood flow [5-7] are the Navier-Stokes equation. Essentially, Navier-Stokes equation represents the second Newton's law applied to the mass of fluid in control volume. This set of equations is expanded with continuity equation of fluid flow.

Using Galerkin method, with appropriate interpolation functions and integration by volume of finite element, a matrix form of previous equations is obtained:

$$\mathbf{M}\dot{\mathbf{V}} + \mathbf{K}_{vv}\mathbf{V} + \mathbf{K}_{vp}\mathbf{P} = \mathbf{F}_v \quad (1)$$

$$\mathbf{K}_{vp}^T \mathbf{V} = 0 \quad (2)$$

Components of this matrix and vectors are:

$$\bar{\mathbf{M}}_{IJ} = \rho \int_V h_I h_J dV \quad (3)$$

$$(\bar{\mathbf{K}}_{vv})_{IJ} = \int_V h_I v_j h_{J,j} dV + \int_V \mu h_{I,j} h_{J,j} dV \quad (4)$$

$$(\mathbf{K}_{vpi})_{IJ} = - \int_V h_{I,i} \hat{h}_J dV \quad (5)$$

$$(\mathbf{F}_{vi})_I = \int_V h_I f_i^v dV + \int_S h_I (-p \delta_{ij} + \mu v_{i,j}) n_j dS \quad (6)$$

By grouping equations (1) and (2), system of differential equations is presented as:

$$\begin{bmatrix} \mathbf{M} & 0 \\ 0 & 0 \end{bmatrix} \begin{bmatrix} \dot{\mathbf{V}} \\ \mathbf{P} \end{bmatrix} + \begin{bmatrix} \mathbf{K}_{vv} & \mathbf{K}_{vp} \\ \mathbf{K}_{vp}^T & 0 \end{bmatrix} \begin{bmatrix} \mathbf{V} \\ \mathbf{P} \end{bmatrix} = \begin{bmatrix} \mathbf{F}_v \\ 0 \end{bmatrix} \quad (7)$$

The system of equations (7) is a symmetrical system of nonlinear differential equations of first order by unknown values in nodes \mathbf{V} and \mathbf{P} . The matrix \mathbf{K}_{vv} (4) is nonlinear, since it depends on velocity.

Wall shear stress is a hemodynamic factor which has great importance to study the problem of blood flow. Wall shear stress is calculated using equation:

$$\tau_w = -\mu \left. \frac{\partial \mathbf{u}_t}{\partial \mathbf{n}} \right|_{wall} \quad (8)$$

where τ_w is wall shear stress, \mathbf{u}_t is tangential velocity and \mathbf{n} is the direction of a unit vector normal to the wall at the moment.

B. In-house software PAK-F

The in-house software package PAK-F [8] is developed by Laboratory for Engineering Software (University of Kragujevac, Faculty of Engineering, Kragujevac). It consists of modules for steady and transient incompressible fluid flow with heat transfer and is based on finite element method and the fundamental equations of viscous fluid flow.

The main program loops per time steps. Within this loop there is loop per iterations. Solving nonlinear equations of fluid flow (7) is performed iteratively. The size of unbalanced loads is determined in current iteration. It corresponds to the increments of speed and pressure. This procedure continues until convergence criteria are not satisfied or until corresponding increments of displacements and pressures are not become enough small.

Results obtained by PAK-F are printed in *.vtk file for post-process in software Paraview [9], as described in [10].

C. Mesh generation

To apply the methodology of calculating the fluid flow hemodynamic parameters (blood) to the human's

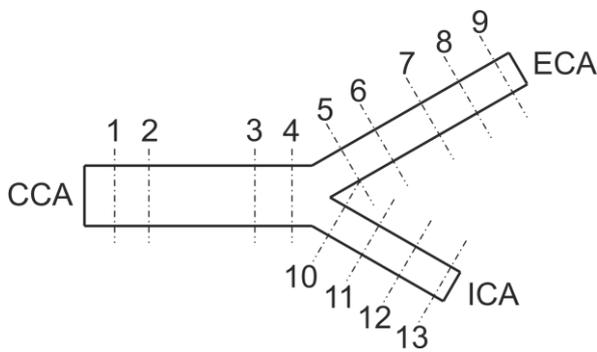


Figure 1. Schematic model of carotid artery bifurcation

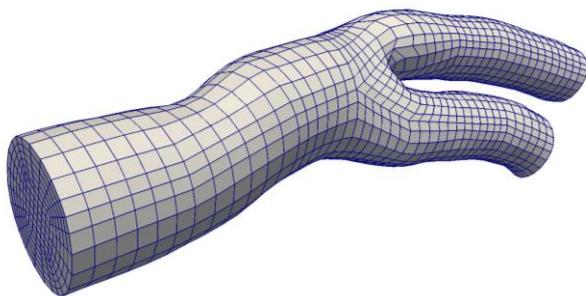


Figure 2. Fem model of carotid artery bifurcation

bifurcations, it is necessary to make a realistic patient-specific model. A schematic model of the carotid bifurcation is shown in Fig. 1. In order to create an analysis file for software PAK-F, it is necessary to create finite element model. Reconstruction of the geometry of blood vessels is conducted in the software Mimics, based on CT images of patient provided by Clinical Centre of Serbia (Belgrade). Multiblock approach is used in mesh generation [11]. Blocks are created by in-house software STL2BLOCK. Based on blocks, quadratic eight-node isoparametric elements are generated in IA-FEMesh [12] (Fig. 2).

The calculation was performed in 30 steps (10 by 0.02s and 20 by 0.03s which gives in total 0.8s). The average flow velocity in the inlet is measured for each observed patient. Density of blood and coefficient of dynamic viscosity are adopted according to [13-16].

D. Remote Visualization with ParaView

ParaView is an open-source, multi-platform client-server data analysis and visualization application. ParaView is developed to analyze extremely large datasets using distributed memory computing resources. The ParaView client runs on office computer (Clinical Centre of Serbia, Belgrade) while the server will run at the remote computing site (Laboratory for Engineering Software, Kragujevac), Fig. 3. Running ParaView remotely in a client-server configuration may involve establishing an ssh tunnel to the login node, launching the ParaView server, connecting the server to the client over. The following text describes the steps to install ParaView on desktop and configure it to launch remote jobs within the ParaView GUI.

The first step is to install ParaView. Version 3.14.1 is currently the recommended version. The ParaView client is a serial application and is always run with the *paraview* command. The ParaView server is enabled with the *pvserver* command. For new server configuration ParaView will run an external command to start the server. The external command will be run using *exec()* (Posix systems) or *CreateProcess()* (Win32), so shell-specific functionality such as redirection or "&" cannot be used. A set of predefined and user-defined environment variables are used to communicate connection parameters.

To simplify the user experience, predefined ParaView server configurations for users from Clinical Center of Serbia is provided. This is performed with an external XML file. This page defines an XML schema for storing server configurations that is based on the existing functionality. Meaning of tags in xml file is given in the following text.

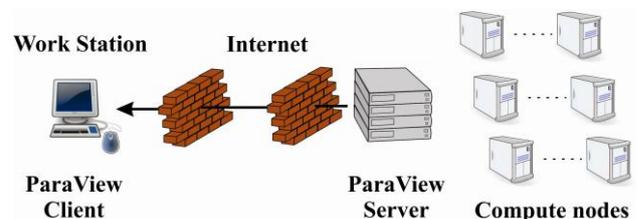


Figure 3. Calculation data remote visualization in Paraview via Internet

The <Servers> tag is the root element of the document, which contains zero-to-many <Server> tags. Each <Server> tag represents a configured server. The "name" attribute uniquely identifies the server configuration, and is displayed in the user interface. The "resource" attribute specifies the type of server connection, server host(s) and optional port(s) for making a connection. The "owner" attribute specifies where the configuration originated. Current valid values are "builtin", "site", or "user". The client uses this information to set policy, "builtin" and "site" configurations are read-only, "user" configurations are stored in per-user preferences.

The <CommandStartup> tag is used to run an external command to start a server. An optional <Options> tag can be used to prompt the user for options required at startup. Each <Option> tag represents an option that the user will be prompted to modify before startup. The "name" attribute defines the name of the option, which will become its variable name when used as an environment variable, and for purposes of string-substitution in <Argument> tags. The "label" attribute defines a human-readable label for the option, which will be used in the user interface. The optional "readonly" attribute can be used to designate options which are user-visible, but cannot be modified. A <Range> tag designates a numeric option that is only valid over a range of values. The "type" attribute controls the type of number controlled. Valid values are "int" for integers and "double" for floating-point numbers, respectively. The "min" and "max" attributes specify the minimum and maximum allowable values for the option (inclusive). The "step" attribute specifies the preferred amount to increment or decrement values in the user interface. The "default" attribute specifies the initial value of the option. As a special-case for integer ranges, a default value of "random" will generate a random number as the default each time the user is prompted for a value. A <String> tag designates an option that accepts freeform text as its value. The "default" attribute specifies the initial value of the option. A <Boolean> tag designates an option that is either on/off or true/false. The "true" attribute specifies what the option value will be if enabled by the user. The "false" attribute specifies what the option value will be if disabled by the user. The "default" attribute specifies the initial value of the option, either "true" or "false". An <Enumeration> tag designates an option that can be one of a finite set of values. The "default" attribute specifies the initial value of the option, which must be one of its enumerated values. Each <Entry> tag describes one allowed value. The "name" tag specifies the value for that choice. The "label" tag provides human-readable text that will be displayed in the user interface for that choice. A <Command> tag is used to specify the external command and its startup arguments. The "exec" attribute specifies the filename of the command to be run. The system PATH will be used to search for the command, unless an absolute path is specified. The "timeout" attribute specifies the maximum amount of time (in seconds) that the client will wait for the server to start. The "delay" attribute specifies a delay (in seconds) between the time the startup command completes and the time that the client attempts a connection to the server. <Argument> tags are command-line arguments that will be passed to the startup command.

String substitution is performed on each argument, replacing each \$STRING\$ with the value of a predefined or user-defined variable. Arguments whose value is an empty string are not passed to the startup command.

The <ManualStartup> tag indicates that the user will manually start the given server prior to connecting. An optional <Options> tag can be used to prompt the user for options required at startup.

Configuration file is saved on location depending on operating system. On fig. 4 configuration interface for connecting with server is shown. Graphical user interface of Paraview in remote visualization of calculation data example is shown in Fig. 5. With ParaView cardiologists can quickly build visualizations to analyze analyzing data using qualitative and quantitative techniques. The data exploration can be done interactively in 3D or programmatically using ParaView's batch processing capabilities. In this way, doctors can have the full advantage of using a shared remote high-performance rendering without leaving their offices.

Velocity field along a streamlines in steps 1, 3 and 5 are shown in Figures 6, 7 and 8, respectively. Fluid velocity is changed depending on the region that is being observed on carotid artery bifurcation. On the internal carotid artery (ICA) it can be seen where there is a narrowing of blood vessels it leads to increased blood flow velocity.

Fig. 9 shows wall shear stress in step 05 of cardiac

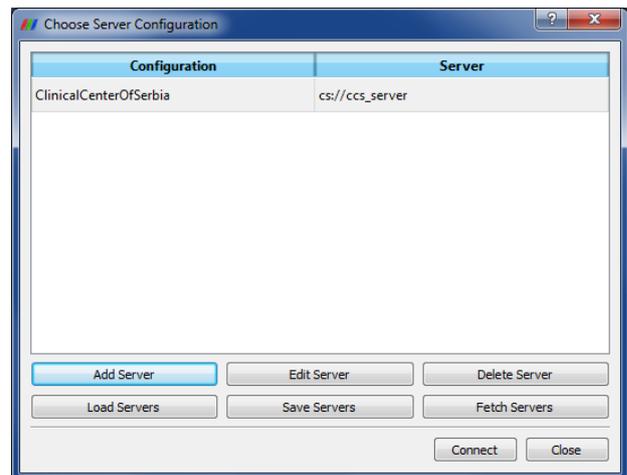


Figure 4. Configuration interface for connecting with server

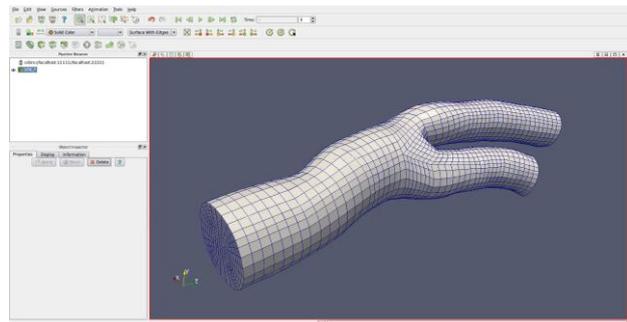


Figure 5. Paraview GUI in remote visualization of calculation data example

cycle. In this step there is maximum value of wall shear stress at peak systolic flow. On the external carotid artery (ECA) where cross section is bigger and flow velocity is smaller there are low values of wall shear stress. In these areas where wall shear stress has small values there is possibility for the occurrence of atherosclerosis.

III. CONCLUSION

Provided case study illustrates the application of PAK-F in the study of hemodynamic characteristics of patient-specific carotid artery bifurcation. Calculation results are displayed client side (medics) by client server applications.

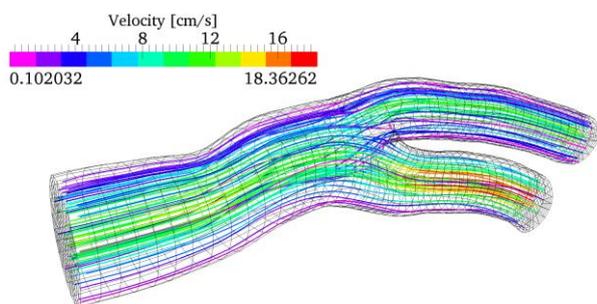


Figure 6. Velocity field in step 01

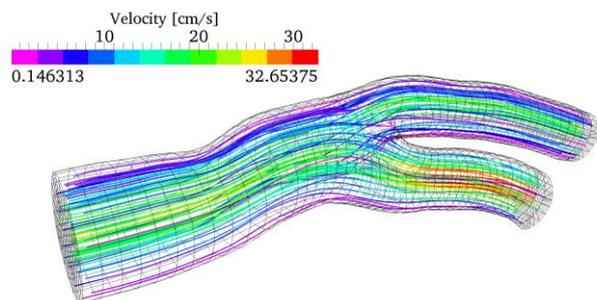


Figure 7. Velocity field in step 03

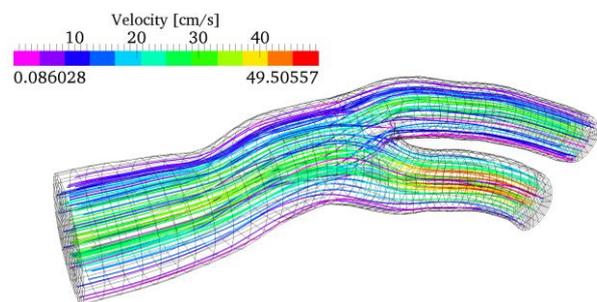


Figure 8. Velocity field in step 05

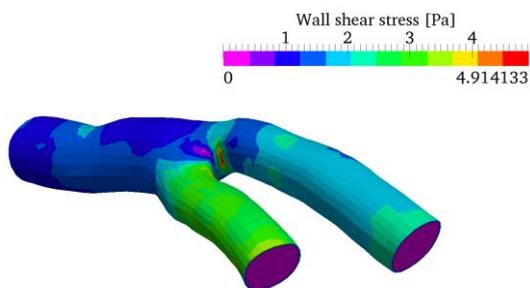


Figure 9. Wall shear stress in step 05

The combination of PAK-F with certain programs for pre-processing and post-processing gets a powerful tool in decision making. The previous considerations indicate that developed platform is software tool which can give useful inputs to cardiologists. They have clear view about insight of the blood flow through carotid artery bifurcation, so they can suggest surgical intervention or not.

Constriction problems of blood vessel can be successfully solved by installing the stents in positions with a possibility of total congestion of blood vessels. After placing the stent, blood vessel lumen and cross section is increased. Due to the rapid creating the model, calculation, and the presentation to cardiologists, approximate analysis of the coarse models may be conducted at each physical of individual patient. In this way it is possible to monitor the patient and determine the optimal moment in time of plaque development for stenting.

The ongoing research is oriented to the upgrade of software that will give a platform for coronary arteries and heart malfunctioning simulation.

The large variety of hardware, operating systems, and MPI implementations makes installing precompiled binaries of parallel ParaView impossible. Thus, to use ParaView on a parallel server, user has to compile ParaView from source. The server is a parallel MPI program that must be launched as a parallel job. The most common way is to use the *mpirun* command.

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Application of O3D Plug-In in Development of Educational Web Based Application for Interactive Exploration of 3D Digitized Data

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Abstract – Technologies for volumetric models generation of real physical objects using 3D scanning methods are more accessible than ever. On the other hand, realistic 3D models display over the Internet is a challenging problem that dates back to its origin. This paper presents a method that solves this problem by using O3D plug-in for compatible web browsers. Methodology is presented on the example of the spinal vertebrae model that can be used for educational purposes. First of all, the 3D digitalization of physical vertebra model is performed. Then, the procedure for creating a web application that the model makes available to wide range of users on the Internet is shown. Thus generated realistic 3D representation is used as educational resource for biomedical engineering education and medical students making the learning process interesting and interactive. Also, public availability of original models on the Internet enables researchers to generate mathematical models, such as the finite element models, for research in various fields of science.

I. INTRODUCTION

Recent improvements in 3D scanning technology allow reliably and accurately digitizing the external shape of many physical objects with high definition [1-7]. Optical measuring methods are the most cost-effective and affordable way to do accurate 3D scanning and/or measurement. There is no way to record a complex object's geometry than with a high resolution 3D scan. Measurement accuracy can fluctuate, because it depends on several interrelated factors. The most important factors are: quality and resolution of the camera used to measure, size of measured object, the number of individual measurements, the geometric arrangement of individual measurements in relation to the object, and in relation to each other. Overall system accuracy is fairly enough to guarantee excellent quality with sub-micron errors. This contactless method is suitable, because the measuring instruments are robust and mobile. It does not require any complex, heavy and maintenance-intensive hardware.

Non-contact optical digitization performed through optical measuring systems, captures hundreds of thousands of points in a single shot of the object. A result of digitization is detailed triangulated mesh. Resulting 3D models can be used for digital documentation as well as to perform different analysis, measurements, feature extractions or creating realistic web environments for

education of biomedical engineers and students of medicine [8].

Today's Internet knows many web-based solutions in this area. The Body Browser from Google [9], ZygoteBody from Zygote [10], BioDigital Human from BioDigital Systems [11], and Visible Human Project from The University of Michigan [12] offer Internet users a new, hi-tech way to explore the human body. These online resources obviously can help students at virtually every level as well as individuals who want to learn human body anatomy. These new tools promote knowledge and learning while having fun. Browsing the body, users can learn how the amazing body works, tearing away layers of the human anatomy. For those who already work in the health field, these applications do not take long to learn how to use. Internet users will likely quickly adapt to familiar and intuitive controls as they surf the human body. However, models of organs on these applications are not publicly available. Also, there is no option to discover in detail and interactively anatomy of individual human organs.

This paper presents web application based on plug-in implementation of O3D [13], an open-source JavaScript API for creating rich, interactive 3D medical applications in the browser. The O3D library provides drawing primitives for creating shapes directly within web application (point list, triangle list, triangle strip, triangle fan). This paper presents method to generate web resource from models obtained by 3D digitizing using O3D plug-in and code importing content from a COLLADA files.

II. MATERIALS & METHODS

A. 3D Digitizing

The fundamental principle used in 3D digitizing is triangulation. By taking 2 photographs from different locations, so-called lines of sight can be developed from each camera to points on the object [4-6]. Since light moves along straight lines in a homogeneous medium such as air, 3D reconstruction equations is derived from geometric constructions involving the intersection of lines and planes, or the approximate intersection of pairs of lines (two lines in 3D may not intersect). These lines of sight, called rays, are mathematically intersected to produce the 3D coordinates of the points of interest. A

point is reconstructed by intersecting two or more corresponding lines. After establishing correspondences across two or more views, using the knowledge of the projection matrix of the cameras, triangulation recovers the scene depth. The accuracy of the triangulation is higher if the angle between the rays is increased.

ATOS (Advanced Topometric Sensor) is a high resolution optical 3D scanner [14]. Full geometry of part is captured in a dense point cloud or polygon mesh describing the object's surface and primitives precisely. The ATOS system is a structured light (white light) optical scanner which scans three-dimensional objects and converts the images to high density point clouds. This allows accurate measurement and capture of the shape and size of the visible surface of almost any 3D object. The scanning is based on optical triangulation and stereo-viewing. A projector is used to project striped fringe patterns onto the object's surface. These images are captured simultaneously by the two measurement cameras from different angles. Throughout multiple individual measurements the entire surface is recorded. ATOS digitizing sensor calculates its 3D coordinates based on visible reference objects - uncoded reference points. This stereo-setup supports an easy and very accurate 3D capturing of the reference objects. With the help of digital image processing, 3D-coordinates are computed fast and with high accuracy for up to 4 million camera pixels using the supplied high end System PCs. The captured scan data is then automatically integrated in the predefined reference marker framework.

The additional data captured with two cameras of the ATOS system are used to verify the calibration of the system, detect movements and high ambient light changes during the measurement and verify the matching accuracy of the individual scans into the global coordinate system.

Prior to use the measuring procedures, calibration of the measuring system is performed. Calibration is a measuring process during which the measuring system with the help of calibration objects is adjusted such that the dimensional consistency of the measuring system is ensured. As calibration object for this measurement calibration panel is used. At the end of the calibration process, the software displays the calibration results. For a good calibration, the calibration deviation needs to be between 0.01 and 0.04 pixels.

In order to meet requirements defined by optical measuring system, object is properly prepared for 3D digitization process (Fig. 1). In this measuring project, measuring object is prepared from the point of its application for accurate generation of a point cloud. Measuring project must provide a precise determination of the ATOS sensor position in all individual measurements necessary to digitize the complete surface. Measuring process is carried out through sufficient number of individual measurements. All individual measurements are made at an angle 45° - 60° relative to the plane in which lies the measuring object.

After a measuring object is digitized completely, the measuring points need to be transformed into an editable polygon mesh. Polygonization means that the measuring point cloud is converted into a mesh of non-overlapping



Figure 1. ATOS (Advanced Topometric Sensor) 3D scanner

triangles. Depending on the curvature of the object, the mesh has different densities. During the polygonization process, the individual measurements are fine adjusted to each other and recalculated with the highest point resolution. The overlapping areas are deleted and stitched up to a polygon mesh. Point Cloud generated by Optical Measuring System ATOS is located in random coordinate system. Model transformation in an appropriate coordinate system is performed using 3-2-1 transformation.

Depending on application, creating of the model's surface is carried out with introduction of certain assumptions and approximations. Point cloud or polygonized mesh is imported in Open-Source software MeshLab [15]. Mesh cleaning, spikes, discontinuities and other errors removing in point cloud are performed in order to make regular mesh. In preview of model via Internet, the reconstructed model contains too many elements (triangles, edges, vertices) to be amenable for further processing. A widely used method decimates the model by contracting edges with their incident triangles. These phases include some distortion in working data and resulting mesh is compare with source point cloud in form of complete deviation field in order to evaluate quality of performed reconstruction.

B. O3D Plug-in

O3D is an open-source web API for creating rich, interactive 3D applications in the compatible browser. O3D API is launched on April 2009, establishing a new standard for 3D graphics on the web. The O3D API is

intended for web developers who are familiar with JavaScript and have some background in 3D graphics. Because the O3D application runs as a browser plug-in, users do not have to download and run standalone application code on their systems.

O3D extends the client-side software of a web application by providing features at the following levels (Fig. 2): (a) System, (b) Content and (c) Code. O3D provides a browser plug-in that adds graphics capabilities inside standard web browsers on Windows, Macintosh, and Linux platforms. Content for today's web is in the form of HTML, image files, and video files. COLLADA make it easy to transport 3D content via Internet. COLLADA Converter imports volumetric model from content creation applications such as Meshlab, Geomagic Studio or Google SketchUp and generate interface files containing digitized geometry that is transmitted over Internet. It resolves all absolute file references into relative URLs and converts the .dae file into a file called scene.json in the archive. COLLADA format is an open standard for 3D assets that is supported by popular content creation applications such as SketchUp, 3ds Max, and Maya, and (O3D extends application JavaScript code with an API for 3D graphics. It uses standard JavaScript event processing and callback methods). The O3D API maximizes performance by programming to the GPU's shader language directly, an advantage over pure software rendering. Since JavaScript has become a lot faster, web browsers are able to run content on Windows computers without having to rely on installed OpenGL drivers.

The basic tasks performed in an O3D program are the following: (a) Create the O3D object, (b) Assign values to global variables and initialize utility libraries, (c) Create the pack to manage O3D objects, (d) Create the render graph, (e) Set up the draw context (perspective and viewing transformations), (f) Create an effect and load the shader information into it, (g) Create the material and shape, set the material's draw list, and set up other material parameters, (h) Add the transforms and shapes to the transform graph, (i) Create the draw elements for the primitives, and (j) Set the optional render callback function, if desired, to perform special tasks each time the 3D scene is rendered.

To develop an O3D application, required tools are O3D plug-in and a text editor for writing JavaScript code. The major components of the software stack are the following: (a) O3D JavaScript application, (b) O3D JavaScript API, which contains the classes and functions used in application (This source code is open source written in C++), and (c) The O3D JavaScript application code is completely contained in an HTML document that is loaded into a web browser. The O3D software communicates with user system's graphics hardware (GPU) through either the OpenGL or Direct3D library. The figure shows a simplified view of the O3D software stack.

C. Web Application Implementation and Use

Row COLLADA files exported from MeshLab are converted by the COLLADA Converter [16] for use by the O3D JavaScript API (Fig. 3). COLLADA™ defines a

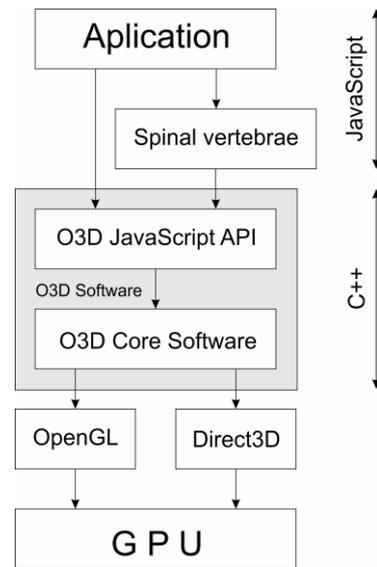


Figure 2. Simplified view of the O3D software stack

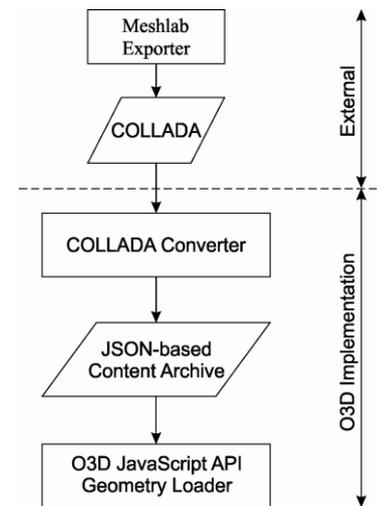


Figure 3. An example of processing content for 3D

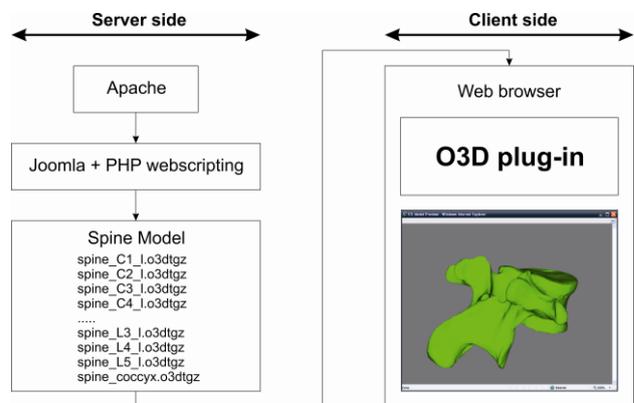


Figure 4. Algorithm to show Stereo Lithography Model

XML-based schema to make it easy to transport 3D assets between applications without loss of information, enabling diverse 3D authoring and processing tools to be combined into a content production pipeline. The intermediate language provides comprehensive encoding of visual scenes (including: geometry, shaders, effects, animation, and kinematics).

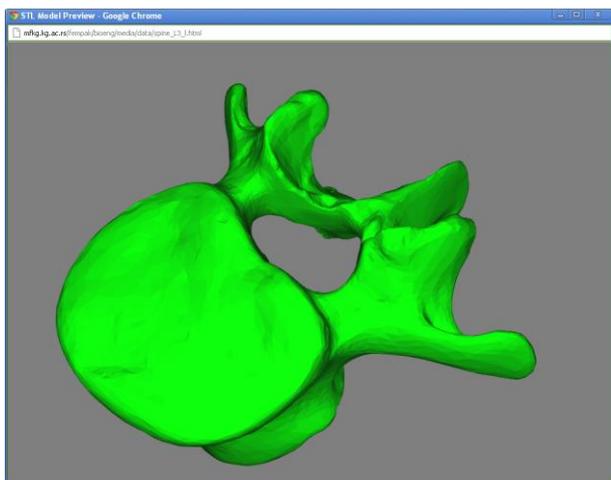


Figure 5. Volumetric model preview in Google Chrome web browser using O3D plug-in

The user, through the dedicated web page [17], has to run O3D plug-in which installs and automatically configures the client to access the graphics application (Fig. 4). It is not required to the user to know any configuration features or install other kind of applications. Between the client and the server the data transfer is exclusively represented by a stream of row models. Operations delegated to the client are limited to model preview and keyboard and mouse input management. With this kind of technology the user can utilize hardware tools such as netbook or PDA, even despite the limited bandwidth connection, to access the platform (Fig. 5).

III. CONCLUSION

3D scanning is used in different fields, such as topographic mapping, architecture, police investigation, geology, archaeology, as well as in education. In field of education digitization 3D scanning offers an accurate and cost-effective solution in a number of different application areas.

Through the shown process, we extract the free-form shape of any physical object. The physical model of the surface very accurately describes the complex geometry of digitized items. The non-invasive fringe projection method used in white light scanning allows non-contact digitization of sensitive objects. There is plenty of open-source software for point cloud handling. This fact points to the importance of this topic in branch, research and development.

Presented application is user-comfortable and provides detailed insight into anatomy of presented model. Thanks to many positive characteristics and world wide availability, in addition to the presented, can find a variety of applications. As a very important feature, we emphasize that all the models created so far completely free accessible to registered visitors of the web portal. This property enables users to use models offline in software handling point clouds and its use for mathematical modeling, such as finite element method [18-19]. Also, model improvements are made continuously.

This API was originally shared at an early stage as a browser plug-in but has evolved into a JavaScript library. Nowadays, a JavaScript implementation of the O3D API using WebGL was replaced the original O3D plug-in. WebGL, a 3D graphics API based on OpenGL ES 2.0, has gradually emerged as a standard, and is supported by other browser and hardware vendors like Mozilla, Apple and Opera. The O3D project is changing direction on May 2010, evolving from its plug-in implementation into a JavaScript library that runs on top of WebGL. Users and developers are still be able to download the O3D plug-in and source code, but other than a maintenance release, Google stopped developing O3D as a plug-in and focus on improving WebGL and O3D as a JavaScript library.

ACKNOWLEDGMENT

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Hair Color Manipulation in PhotoShop

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Abstract – This paper aims toward comparing two techniques for changing hair color in Photoshop CS6. The first technique, that includes invoking Hue/Saturation dialog box in order to select desired color, is the less intimidating for the novice users and it produces fast results but lacks some fine tuning options. Second technique includes working with Curves in order to manipulate color via Red, Green and Blue channel independently. Both techniques produce similar results, but the second technique gives us more power and ability to fine tune the final result. In order to get the most from curves, some broader knowledge of color theory is required and we have tackled this in this paper, in the shortest and most comprehensive form it could have been delivered. A good selection is crucial for both techniques to work at their best. We have chosen to use brush tool to make selection and then to refine the selection with the creation of mask.

I. INTRODUCTION

The main idea of this paper is to present one of the interesting topics for every Photoshop user, how we can manipulate hair color in Photoshop CS6. Two techniques are described for this purpose. Understanding these techniques unlocks other modifications that we might want to do. For example, following these steps we can easily change eye color, color of clothes or something else on the photo that needs a color swap for visually more pleasing results or just for fun. We are limited only by our imagination.

These techniques are so common among Photoshop users community that it is hard to pinpoint their original inventor. However, every user favors some technique over another. In this paper we have presented two techniques that, in our opinion, give the best results and are fairly quick and easy to reproduce. While talking about results regarding this example, we are looking for natural effect, where change is obvious, but remains in the realm of believable.

II. OVERVIEW OF USED TECHNIQUES

A. Technique that uses Hue/Saturation dialog box for hair color manipulation

This technique has been around Photoshop users and professional fashion photographers for a very long time [1]. It relies on the accurate selection of the hair, and after this crucial step the Hue/Saturation dialog box is invoked. Hue/Saturation dialog box presents us with three text boxes that accept values for Hue, Saturation and Lightness. With these three values that we specify, we can manipulate color on the selected area.

B. Technique that uses Curves for hair color manipulation

The second technique includes usage of Curves to manipulate color. It is considered to be more powerful than the first technique and also has a broader use. Besides manipulating color on the selected areas on the photo, in our case hair, curves can also be used to adjust color on the whole picture, which is known as color correction and it is sometimes necessary to do, because we do not always have perfect light conditions when taking photos and this inadequate conditions can lessen the vividness of color on the whole photograph [2, 3].

This technique has been incorporated in Photoshop from the very beginning, but with every new version of Photoshop new tools are introduced and the trend is to introduce user friendly tools as much as possible, and curves tend to be intimidating to new users so this technique as powerful as it is, may not be the first choice for novice Photoshop users [4].

III. APPLICATION OF TECHNIQUES

This paper explains in great details two techniques for hair color manipulation. First technique, in our opinion, is quicker and somewhat easier for novice Photoshop users; it allows new users to feel the power of Photoshop without having to dive deep into inner workings of the program. Second techniques is also described in detail and it includes use of Curves, it is considered to be more advanced way of manipulating color in Photoshop. For users who like to tackle new things and ideas this technique is well worth time to take a look at.

The following example shows in detail how we can change hair color in Photoshop CS6 with realistic results. Original photograph is shown on Figure 1 [5].



Figure 1. Original photograph

A. First technique

The key to this technique lies in good selection of the hair. There are various techniques that enable us to deal with this kind of selection. The choice depends on picture itself, depending on how tricky the selection is (relation of subject and background, more contrast between subject and background tends to make selection easier). From this starting point depends the result of the selection. Sometimes the selection can be very successful and sometimes not so successful in terms that it is very hard, almost impossible to transfer every detail into selection.

For the realization of this effect we will be using the simplest solution. We will create New Layer and while we are on the New Layer we will pick Brush tool from the toolbox. Brush size depends on how large is the surface we are painting. We can enlarge Brush using the key on the keyboard. White is the color we are going to paint with.

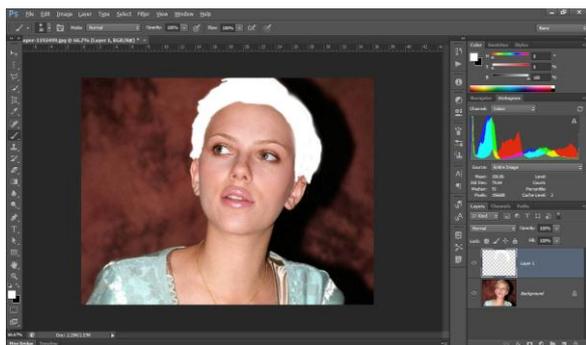


Figure 2. White color applied with the Brush tool

After applying white color on the canvas (Fig. 2), while we are on the recently created Layer, we are going to change Blend Mode from Normal to Soft Light. After this step we can see the initial changes in hair color, it is much brighter now. To be able to affect hair color in more detail we are going to open Hue/Saturation dialog box.

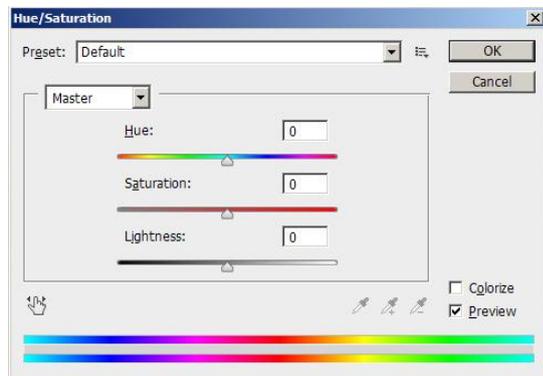


Figure 3. Hue/Saturation dialog box

In the newly opened window (Fig. 3) we are going to check Colorize check box and then we can manipulate sliders for Hue, Saturation and Lightness to create new desired color. For this case, we used: Hue 295, Saturation 48 and Lightness is set to negative 91 which creates the effect as shown in figure 4:



Figure 4. Look of the photo after Hue/Saturation adjustment

Imprecision with the Brush tool use can be revised with the creation of mask. After that, select the Brush tool again, selected color should be black and with the adjusted size of the Brush paint on the Layer where selection of the hair is. Since we have created a mask, the Brush tool will reveal pixels from the Layer beneath where our original photo is, rather than painting with black, as it normally does. Hair line (part where forehead and hair meets) is still sharp; to smoothen the transition we should use filters. Blur / Gaussian Blur is the best candidate for this job. Value of 7 gives the best result as shown in the preview (Fig. 5).

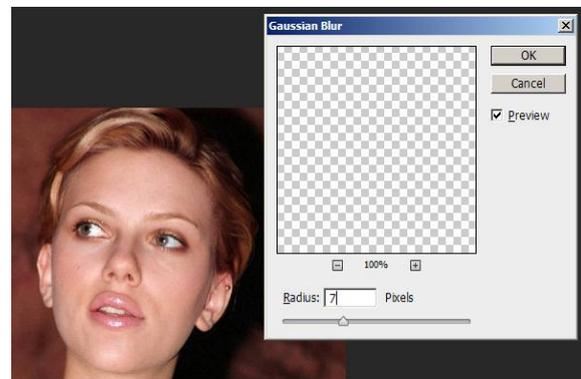


Figure 5. Gaussian Blur filter applied

Comparative review of the original photo (on the left side) and the final result (photo on the right side) is shown in Fig. 6.



Figure 6. Before the effect (left) and after the effect (right)

This is one way how we can change hair color in Photoshop, there are many other techniques that can reproduce the same result and many of those techniques are slightly different then this one. The differences are minor. One technique, however, deserves to be described in detail. It is considered to be the most powerful, but also

requires some deeper knowledge of color theory. We could reproduce the same effect as above using Curves.

B. Basic color principles

To truly understand Curves, one should be familiar with basic color principles. Every color we see on the monitor is the combination of Red, Green and Blue. White light on the monitor is the balanced amount of those three colors. To see more information about color values it is very useful to have Info panel tab opened in Photoshop when dealing with color corrections using Curves. If we analyze the photo above, hovering with the eye dropper tool, while info panel is opened, we can see just by observing the photo that the whitest part of the photo are white area of the models eye (*lat. sclera*), info panel gives the following values when hovering over white area of the eye: Red 246, Green 243, Blue 243. If the numbers on all three channels were 255, that would mean the complete absence of color (all the light is reflected, none absorbed, while with black R:0, G:0, B: 0 all the light is absorbed, none is reflected) and we say that the colors are balanced because all three channels have the same value of 255. Shade of gray is also balanced amount of Red, Green and Blue. For example, R: 254, G: 254, B: 254 is one shade of gray, numbers are perfectly balanced, if there is some color the numbers are not going to be balanced. Having that in mind, if we pick a vivid color in the above picture with the eye dropper tool, for example somewhere on the lower lip of the model, we can read the following numbers from the info panel: R: 219, G: 120, B: 125. We see that numbers are not balanced, they are way off, especially the Red channel. The more saturated color the out of balance numbers we see. In the above example with the lip, Red channel has the largest value, because Red is the dominant color in the lip area. Knowing that if we subtract the amount of Red we are going to the opposite color of Red which is Cyan. Removing Red means adding Cyan, and vice versa. Opposite of Green is Magenta, adding green means removing magenta, and vice versa. Opposite of Blue is Yellow, same principles applied. Knowing that, we can produce any color correction we can think of.

C. Second technique

Armed with basic knowledge of color theory we can recreate the previous effect using Curves. Instead of invoking Hue/Saturation dialog box we are going to invoke Curves dialog via Window/Adjustment menu. After invoking adjustment tab we should find and click on the small icon that represents Curves (hover over the icons to see text labels, for Curves it should be labeled "Create a new Curves adjustment layer"). This way we have created a new adjustment layer that should be visible in layers panel (named "Curves 1" by default). Now, we can adjust color and every channel should be adjusted separately from another. If RGB is selected, then it is not going to do anything more than change the brightness of the photo and that is not the effect we are looking for. Figure 7 represents Curves dialog after modification for every channel separately. For the convenience of viewing we shall present it side by side:

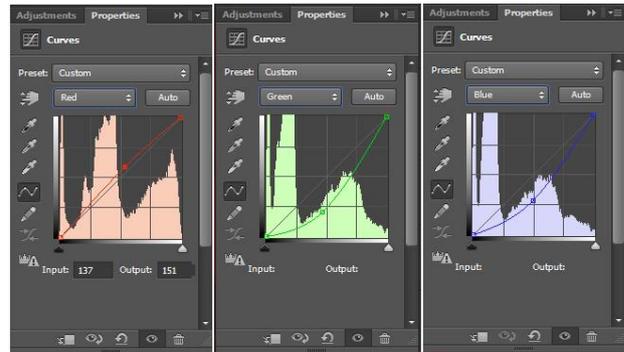


Figure 7. Comparative review of curves for every channel separately

The strategy for replicating effect from the previously explained technique is to add red color on the Red channel, to make the hair a bit reddish, and remove green and blue from Green and Blue channels, in order to increase the Red channel a bit more. In order to reveal the changes in color, we are going to add new layer mask. We are going to invert the mask and then with the Brush tool carefully start painting on the hair, same as with the first technique. The selected color of the Brush should be white, because white will reveal the modified pixels and the black color will hide the modified pixels (that can be useful if we make a mistake with the Brush tool). Figure 8 shows the early stage of our photo manipulation.

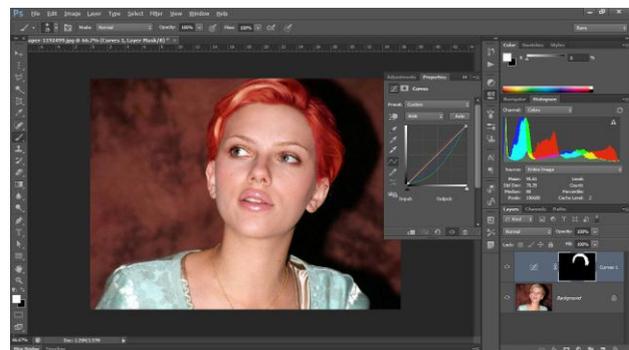


Figure 8. Look of the photo after Curves adjustment and mask creation

As with the first technique, some refining of mask is needed. Figure 9 shows Refine Mask dialog box, which we invoked by clicking on the Mask Edge button in the Refine group (while Curves 1 layer and mask is selected).

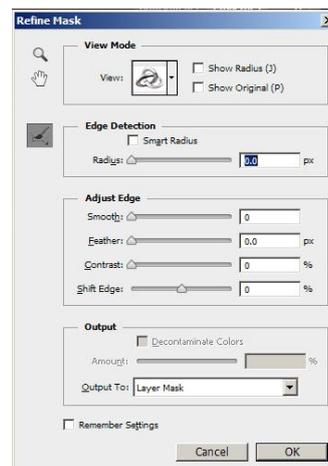


Figure 9. Refine Mask dialog box

For the Adjust Edge group, value for Smooth should be 10, and value for Feather should be 2.4, Contrast remains unchanged while Shift Edge receives new value of -16. Now, we have refined our mask and hair line look more natural. Hair color is too bright and for the natural and realistic effect we are trying to achieve, we are going to decrease the Opacity to 43% and change the blending mode to multiply. The final result is shown in Figure 10.



Figure 10. Result

IV. CONCLUSION

Both of the techniques described in this paper are an excellent choice for color manipulation. Both produce great results, however we tend to favor the second technique more than the first one. We consider Curves as

the most serious and most powerful tool for manipulating color in PhotoShop. Dialogs used in the previous example are made to be simple to understand. Simplicity of the dialog boxes with predefined text boxes, check boxes and sliders are intuitive and made for average user who just wants to make a simple change without hassle. In this case, simplicity obstructs power. Curves are not simple and easy, they are made to enable us the most powerful and precise adjustment we can get. Investing time in understanding Curves is a time well spent, because when you truly understand Curves you are not limited to blindly following steps someone else gives you, instead you can do anything you can think of. Vast amount of power becomes unlocked, readily available at your fingertips to help you deal with the very essence of photograph, to play with shadows and lights, to manipulate color the way you see it and to present how you see world through your eyes, the best way you can, with a picture that is worth a thousand words.

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Using Script Languages for Improving Graphics of Web Based Applications

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Abstract – In this paper we are considering Web graphics improvement using Scripting languages, primarily JavaScript. We present basic graphical methods and graphical libraries through examples. Comparison between JavaScript and other script languages was made.

I. INTRODUCTION

Modern Web applications are becoming more demanding in terms of graphics. Graphic design takes the center stage in the preparation of any Web site, and it must be seriously considered. A graphic becomes meaningful when it defines the text given below properly and images to produce a coherent and interesting piece of work, according to the end goal. The purpose of graphic designing is not limited to that only but it plays a special role in improving sales of a company.

When developing a website, the user's wants and needs should always be in the forefront of the decision making process. That means that Web applications must be user-friendly. There are four main characteristics of a user-friendly Web application:

- Page load speed
- Accessibility
- Navigation
- Information

The very purpose behind developing a website is to be able to reach to a larger section of people.

Standard graphic design that include only HTML are not flexible. HTML has `` tag that defines an image. But, user cannot change attributes of an `` tag (like width or height). There is no high interaction between users and the web page (or application).

Nowadays, script languages take precedence in Web page/application development. Scripts are used to add interactivity to otherwise static Web pages. They also can perform repetitive tasks like automatically filling out parts of Web-based forms, among other uses. In this paper, we focused in graphical methods of script languages.

The HTML5 `<canvas>` element is used to draw graphics, on the fly, via scripting (usually JavaScript) [1]. The `<canvas>` element is only a container for graphics. You must use JavaScript to actually draw the graphics. Canvas has several methods for drawing paths, boxes, circles, characters, and adding images.

II. GRAPHICAL METHODS IN JAVASCRIPT

The most popular script language in Internet programming is JavaScript. JavaScript (JS) is a prototype-based scripting language that is dynamic, weakly typed and has first-class functions. It is a multi-paradigm language, supporting object-oriented, imperative, and functional programming styles. JavaScript runs on the browser (client) and does not require any server software. Thus, it is a client-side scripting language. Since all execution takes place on the browser, JavaScript is responsible for most of the interactivity on a web page [2].

JavaScript has several graphic methods, which can be combined for creating complex graphic objects. Two primitive graphic objects are Rectangle and Arc.

The rectangle has three constructors:

1. `clearRect(x,y,width,height)`,
2. `fillRect(x,y,width,height)`
3. `strokeRect(x,t,width,height)`

Arc are drawn with `arc(x,y,sAng,eAng,rotFlag)`, where `sAng` and `eAng` are in radians. Paths are used for more complex shapes. Paths are drawn with `beginPath()`, `moveTo(x,y)` [pen up], `lineTo(x,y)` [pen down], `closePath()`, `stroke()`.

Let us now consider how JavaScript can improve graphic characteristics of a web page. The true power of JavaScript is not just loading or drawing images in web page, but their manipulation. We show some examples.

A. Example 1

The way in which the image will be displayed depends on three factors:

- Image size
- Browser's window size
- Monitor size

The image size is constant, which means that the image width and height are constant. But monitor and browser's window sizes are not constant. It depends on concrete monitor that is used to view web page. So, if we want some image to be stretched (that means that its width and height depends on monitor and window sizes) we cannot use HTML `` tag. For that purpose it is

necessary to use a script language (in our example JavaScript in Fig. 1).

```

<body>

<script type="text/javascript">
  var w=window.innerWidth;
  var h=window.innerHeight;
</script>

<canvas id="myCanvas" width=w height=h
style="border:1px solid #000000;"></canvas>

<script type="text/javascript">
  var c=document.getElementById("myCanvas");
  c.width=w;
  c.height=h;
  var ctx=c.getContext("2d");
  ctx.fillStyle="#FF0000";
  ctx.fillRect(0,0,w,h);
</script>

</body>

```

Figure 1. The source code of an Example 1

Code from Fig. 1 can be putted into a single function than would be called when event *onresize* happens. From this example, we can see how with script languages we can easily manage the graphics. Script languages provide high interaction between user and the web page.

B. Example 2

Using script languages, we have available all control structures (e.g. selections, iterations). Control structures allow creating many scenarios for web page content.

This comes useful when web page has been entered by many user types (children/adults, men/women). In those cases it is important to show appropriate contents. For example, if the user is a child, then all adult commercials must be hidden from the web page.

First, we need to know what type of user enters the page. That can be done with simple questioner at the *intro* page. Answers could be presented as radio boxes, so that user can't select more than one answer. Depend on type of user, content images can be changed (some of them hidden, some of them shown).

```

<body>
<canvas id="myCanvas" width=w height=h
style="border:1px solid #000000;"></canvas>
<script type="text/javascript">
  function draw () {
    var
    canvas=document.getElementById("myCanvas");
    if(!canvas.getContext){return;}
    var ctx=canvas.getContext("2d");
    var img=new Image();
    img.onload=function(){
      ctx.drawImage(img,0,0);};
    if(userType=="child"){
      img.src='ChildCommercial.jpg';}
    else{
      img.src='AdultCommercial.jpg';}
  }
</script>
</body>

```

Figure 2. The source code of an Example 2

Source code from Fig. 2 shows us how with *If...Else* statement we can control which commercial image must be showed on the page. If the user is a child, then image "ChildCommercial.jpg" will be loaded. If the user is an adult, then image "AdultCommercial.jpg" will be loaded.

Such flexibility is great but sometimes comes with a penalty (the size of JavaScript files being one of them). Although adopting a well-known JavaScript library is usually a wise decision, you may want to perform a task that can be accomplished by a more lightweight library dedicated exclusively to that task or that is not supported by the more popular JavaScript libraries.

III. GRAPHICAL METHODS USING JAVASCRIPT LIBRARIES

A JavaScript library is a library of pre-written JavaScript code which allows for easier development of JavaScript-based applications, especially for web-centric technologies.

A JavaScript graphics library is a collection of functions used to aid in the creation of graphics for the HTML5 canvas element or the *explorercanvas* emulation for Internet Explorer [3]. These libraries aid in the development and display of graphic elements like particles, motion, animation, plotting and SVG, 3D graphics and in most cases, also provide easier access to JavaScript events.

With the expanded demands for JavaScript, an easier means for programmers to develop such dynamic graphics was needed. Thus, JavaScript libraries such as *Processing.js*, *Raphaël*, *Paper.js* and *jQuery* were created [4].

Almost all JavaScript libraries are released under either a *copycenter* or *copyleft* license to ensure license-free distribution, usage, and modification.

A. *Processing.js*

In this part, we will focus on drawing graphics with *Processing.js*.

Processing.js is the sister project of the popular *Processing* visual programming language, designed for the web [5]. *Processing.js* makes data visualizations, digital art, interactive animations, educational graphs, video games, etc. work using web standards and without any plug-ins. User can write code using the *Processing* language, include it in a web page, and *Processing.js* does the rest.

In Fig 3. is showed a demonstration of recursion in graphics using *Processing.js*, where functions call themselves.

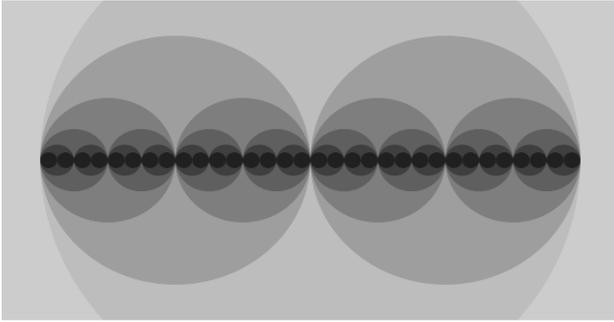


Figure 3. The image created with recursion example

Source code of recursion example is given in Fig 4. Notice how the *drawCircle()* function calls itself at the end of its block. It continues to do this until the variable "level" is equal to 1.

```

void setup()
{
  size(200, 200);
  noStroke();
  smooth();
  noLoop();
}
void draw()
{
  drawCircle(126, 170, 6);
}
void drawCircle(int x, int radius, int level)
{
  float tt = 126 * level/4.0;
  fill(tt);
  ellipse(x, 100, radius*2, radius*2);
  if(level > 1) {
    level = level - 1;
    drawCircle(x - radius/2, radius/2, level);
    drawCircle(x + radius/2, radius/2, level);
  }
}
    
```

Figure 4. The source code of a recursion example

B. Raphaël

Raphaël is a small JavaScript library that should simplify your work with vector graphics on the web. If you want to create your own specific chart or image crop and rotate widget, for example, you can achieve it simply and easily with this library.

Raphaël uses the SVG W3C Recommendation and VML as a base for creating graphics. This means every graphical object you create is also a DOM object, so you can attach JavaScript event handlers or modify them later. Raphaël's goal is to provide an adapter that will make drawing vector art compatible cross-browser and easy.

To use it download and include raphael.js into HTML page, then use it as simple as in Fig 5.

```

// Creates canvas 320 x 200 at 10, 50
var paper = Raphael(10, 50, 320, 200);

// Creates circle at x = 50, y = 40, with
// radius 10
var circle = paper.circle(50, 40, 10);
// Sets the fill attribute of the circle to
// red (#f00)
circle.attr("fill", "#f00");

// Sets the stroke attribute of the circle to
// white
circle.attr("stroke", "#fff");
    
```

Figure 5. The Example code for Raphaël library

C. Differences between JavaScript libraries

Paper.js, Processing.js and Raphaël are the leading libraries for drawing on the Web right now [6]. Major differences between JavaScript libraries for web graphics are given in Table 1.

TABLE I.

	Paper.js	Processing.js	Raphaël
Technology	canvas tag	canvas tag	SVG
Language	PaperScript	Processing script	JavaScript
Browsers	IE 9	IE 9	IE 7
Mobile	Yes	Yes	iOS only
Model	Vector and raster	Raster	Vector
Size	56 KB	64 KB	20 KB

IV. JAVASCRIPT VS. OTHER SCRIPTING LANGUAGES

JavaScript is not the only scripting language that can be used for creating graphics on web applications. We will now compare JavaScript with other modern scripting languages that support graphics.

The language most similar to JavaScript is Microsoft's proprietary language VBScript. Like JavaScript, VBScript runs on client's web browser and adds interactivity to web pages [7]. However, VBScript works only on computers running Internet Explorer (IE) on Microsoft Windows and that means big restrictions. Scripts written in JavaScript are not dependent on web browsers or operating systems. This is a kind of make-it-work-every-where library so that Web page will display the graphics not only on modern browsers, old browsers, android and smart phones but also on many of not-so-smart small screen phones too.

Another modern scripting language for web graphic is ActionScript. It is used primarily for the development of websites and software targeting the Adobe Flash Player platform, used on Web pages in the form of embedded SWF files. Flash graphics and animation are popular, but

they require Adobe Flash Player plug-in. In contrast, JavaScript does not require any plug-in.

A couple of others are up and coming, and you can always use Flash, but these three work well with HTML5 and have the widest support among browser vendors.

V. CONCLUSION

Mobile devices are shipping with higher and higher PPI, and desktops and laptops are following the trend as well. There's no avoiding it: High-pixel-density, or "Retina," displays are now becoming mainstream—and, as you'd expect, our websites are beginning to look a little fuzzy in their backlit glory.

Using JavaScript for displaying web graphics can help us resolve a lot of problems with different size screens and pixel density.

Whether you're an advanced developer or completely new, whether you're a pro with web technologies or just

getting started, using JavaScript libraries for web graphics bridges the gap between these two powerful technologies.

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Impact of Information Literacy in the Implementation of Distance Learning

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Abstract – An increase and improvement of educational process and learning process efficiency can be achieved by developing a new educational model with the application of new educational technologies, such as a system of distance learning. In order for distance learning to be successful, the user must become versed with this new way of teaching and learning in short time. This requires users' greater skills in the information technology, preparation for technical problem solving on-the-go, enabling a new way of communication that will be used, as well as playing an active role in learning, self-awareness and responsibility. The results of the research conveyed by the authors show whether today's students are IT literate, sufficiently for being able for distance learning, and for overcoming any difficulties that might occur.

I. INTRODUCTION

As the foundation of basic education, literacy is not only related to just reading and writing, but also to communication skills, knowledge acquiring, language learning, culture development, etc. Creating a literate environment is one of the important factors in permanent progress of modern society.

In addition to basic or primary literacy, i.e. knowledge of reading and writing as basic skills, today we face the terms of secondary-functional literacy (which is in fact understanding of written instructions in everyday life, e.g. when using certain products, filling in various contracts or forms, orientation on market, traffic, public facilities etc.), as well as the tertiary literacy (which embraces information technologies, computers, Internet, SMS and such). The latter two are insufficiently present, i.e. many people do not have these skills developed, which directly has a negative effect on knowledge improvement and increases the gap between the rich and the poor.

Thus, the IT education is an imperative for all those who aspire to, for example, run a business successfully in the future. Today, mastering strategic use of information technology is becoming as important as the literacy became important after Guttenberg rotated his galaxy. Today's society is evolving into the information society. This is why the technology is becoming a tool to serve information, where the information is knowledge, power and money, so only the question of its use remains. The speed and success in using the information technology will remain the basic factor of strength and utility value of today's managers.

II. COMPUTER LITERACY

The development of information technology increasingly brings the term of information literacy, but its wider concept as well, which is practically the basis for development of contemporary society.

Information literacy is defined as knowledge and ability of efficient computer and other technologies use. Also, it is the recognition of a need for certain information, as well as knowing the way how to find, assess and use the best and newest information available in solving a problem or making a decision. Information sources can be various – books, magazines, computers, TV, film or anything else.

Today, Internet has a special role as a source of information. Information literacy include the following skills:

- Recognition of the need for information,
- Finding the information,
- Analysis and evaluation of information,
- Use of information,
- Publishing the information

In the modern world, the amount of information offered is vast and getting to the really necessary ones requires one's good education, which means that:

- One is aware of their need for information,
- To know technology of information access and retrieval well (primarily computers and the Internet)
- To distinguish similar information from the standpoint of their use,
- To have a clearly defined system of values,
- To know how to preserve and re-use the information when needed,
- To know whether additional information is necessary or the received one is sufficient,
- To learn all the time because the computer literacy today is acquired through permanent, serious and comprehensive training and learning.

III. VARIOUS MEANINGS OF COMPUTER LITERACY

In order to be information literate, one has to be able to establish when a piece of information is necessary and has to be qualified to locate, estimate and efficiently use the information. In the broadest sense, computer literacy refers to the human ability to reach out and understand a number of information resources.

Information literate person is a person who:

- Is aware that accurate and complete information is the basis for making meaningful decisions,
- Is aware of the need for ownership of information,
- Makes questions based on the information technology needs,
- Identifies potential sources of information,
- Develops successful search strategies,
- Logs information sources including computers and other technologies,
- Evaluates information,
- Organizes information that might be applied in practice,
- Integrates new information in the existing system of knowledge, and
- Thinks critically and solves problems based on the use of information.

IV. RESEARCH RESULTS

The aim of this research was to determine whether students have computer literacy necessary for organizing and teaching through a system of distance learning (hereinafter: SDL), in other words - whether they have the knowledge necessary to work on computer, are familiar with and use the Internet and in which purposes.

The research results show how today's students have a predisposition to adjust to distance learning. Also, they show possibilities of overcoming any difficulties which can occur.

A. Sample and research instruments

The survey, included in this paper, has empirical and theoretical character. The survey was conducted during the three school years, in all courses and in all grades at the Technical Faculty "Mihajlo Pupin" in Zrenjanin. The total number of students surveyed in this period was 1765, of which 879 were in the control group and 886 in the experimental group.

The questionnaire was made of the questions where the answers were given as a Likert scale where the respondent, circling one of the following alternatives, shows the degree of acceptance or disagreement with the content of questions, such as the following values:

A = absolutely agree, B = agree, C = none of the above, D = disagree, E = absolutely disagree, F = no answer

B. Hypotheses and subhypotheses of the research

The main hypothesis which was used in this research is:

H0 - respondents have IT literacy required for organizing the education process and teaching through a system of distance learning.

Two sub hypotheses made, derived from and completing the main hypothesis are:

H1 - the participants have the necessary basic knowledge for working on computer and of computer work

H2 - the participants have the necessary knowledge about the Internet and its use

C. The results of having knowledge for work on the computer

A large number of respondents recognize the basic operations of working with files and folders (97%, of which 79% absolutely agree with this statement, while 18% just agree). This can be seen from the results obtained from the statement 'I find the basic operations related to file management clear, like creating and renaming files and folders' (Diagram 1). The number of respondents absolutely disagreeing with this is scarce - 2%, while 1% has no opinion on this topic.

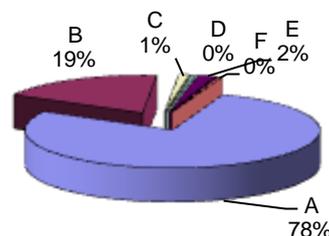


Figure 1. Results on the first statement

The number of respondents who know how to save and find the desired file is even greater, 99%, of which 83% absolutely agree, while 16% just agree with the statement: 'I know how to save and find a file' (Figure 2.). Only 1% of the respondents absolutely disagree.

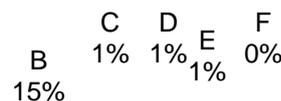


Figure 2. Results on the second statement

The statement: 'I am capable to simultaneously have several applications open and to move among them' elicited varied responses: 76% absolutely agree, only 19% agree, 2% have no opinion (Figure 3.). The number of respondents who absolutely disagree, just disagree and did not respond to the statement is 1% each.

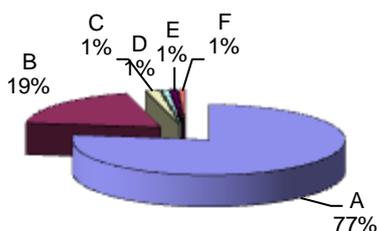


Figure 3. Results on the third statement

The more respondents' computer skills the statements demanded, the greater difference occurred between the answers. The statement: 'I know how to install software on my computer' (Figure 4.) number of respondents who have knowledge necessary to install software on the computer, decreased compared to the previous statements: 59% of respondents absolutely agreed with the statement that they know how to install software on their computers, 24% just agreed, 8% disagreed, 4% absolutely disagreed, 1% did not answer, and even 4% had no opinion on a given statement.

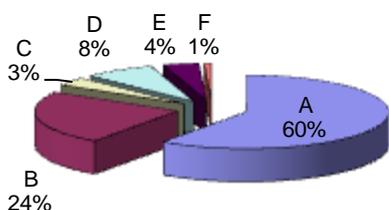


Figure 4. Results on the fourth statement

Knowledge of working on computer requires recognition of technical problems which can occur during operation, as well their successful removal, with or without professional assistance. The number of respondents who agree with the statement 'I know to describe any technical difficulty and can solve it with the assistance' was even more reduced - 74%, and the number of respondents who had no opinion on this statement was increased to 14% (Figure 5.). The number of respondents who disagree remained almost the same as in previous statements, 11% (8% absolutely disagreed, 3% disagreed), while 1% did not give any answer.

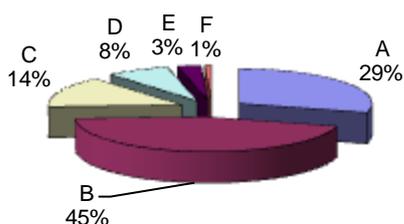


Figure 5. Results on the fifth statement

The results show that respondents have a solid knowledge needed to work on computers, necessary for mastering the course through distance learning. A large number of respondents know to work with files and folders, but the number decreases when it comes to

installing software, or solving problems that may occur during work, and seek the necessary help from the professional staff.

D. Internet use results

As noted, the Internet provides a variety of methods to search for and transfer the information in education and communication. Students use a large number of Web sites, as part of their educational process. Computer literacy is not only the knowledge necessary to work on the computer, but also connection to the Internet, searching websites, using and changing settings on the browser, and so on. Therefore, a part of the research tried to establish the level of knowing and using the Internet.

82% of respondents completely agreed with the statement 'I know how to connect to the Internet' (Table 1.), 15% agreed, and only 2% absolutely disagreed.

However, the statement 'I know how to download items' (Table 1.), got the number of respondents who absolutely agreed reduced to 65%, 17% agreed, but the number of respondents who disagreed increased to 9% (of which 6% disagreed and 3% absolutely disagreed.) The number of respondents who did not have opinion on this statement was 8% and 1% did not respond.

Searching the web material is one of the main advantages offered by the web, but there are fewer respondents familiar with these options compared to the previous statements. 88% of respondents agreed with the statement 'I know how to effectively search the web', (Table I.), of which 59% absolutely agreed, while 29% agreed. The number of those who disagreed reduced to 5% (of which 4% absolutely disagreed, and 1% just disagreed), 6% had no opinion on the statement, while 1% did not give the answer.

TABLE I. COMPARATIVE REVIEW OF THE PREVIOUS THREE STATEMENTS

Statement Degree of accept.	I know how to		
	connect to the Internet	download items	Search the web
absolutely agree	82%	65%	59%
agree	15%	17%	29%
none of the above	0%	8%	6%
disagree	0%	6%	4%
absolutely disagree	2%	3%	1%
no answer	0%	1%	1%

Based on these results, it can be concluded that the respondents know how to use the Internet, but that a number of them are not familiar with the ability to download and later access the downloaded material.

92% of respondents agreed with the statement 'I know how to use the web browser' (Table 2.), of which 76% absolutely agreed, while 16% agreed. 4% of respondents did not agree with the statement (2% absolutely disagreed, and 2% disagreed). 3% of the respondents had no specific opinion regarding these statements. The number of respondents, who know how to change the settings of the browser, is 44% - absolutely

agreed with the statement, 26% agreed, 12% disagreed, 4% absolutely disagreed. 12% of them did not have opinion on this statement (Table II.) and 1% did not respond.

TABLE II. COMPARATIVE REVIEW OF THE PREVIOUS TWO STATEMENTS

Statement Degree of accept.	I know to	
	use the web browser	change the settings of the browser
absolutely agree	76%	44%
agree	16%	26%
none of the above	3%	12%
disagree	2%	12%
absolutely disagree	2%	4%
no answer	0%	1%

Very few respondents have their own web site - only 19%, of which 10% absolutely agreed with this statement, 9% agreed and 65% disagreed (24% disagreed, and 41% absolutely disagreed). 1% of them did not answer, while 14% had no opinion on this statement (Figure 6.).

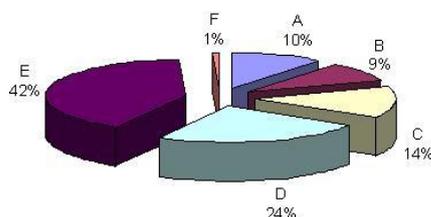


Figure 6. Results on the previous statement

E. Search knowledge and use of software

The number of respondents who disagreed with the statement ‘I am familiar with picture processing programs’ (Table 3.) is 12%, while 2% absolutely disagreed. 60% of respondents agreed with the statement, 17% of which absolutely agreed, and 43% agreed. The number of respondents who had no opinion on this statement is very big - 24%, while the number of respondents who did not respond to it was 2% (Figure 7.).

V. CONCLUSION

A large number of respondents possess and use information technology. They also have the knowledge necessary for working on computers, know how to use software, recognize and use the Internet.

Distance learning can improve learning in many ways, since it brings new experience of working on the

Internet to both students and teachers. The student is always offered the new information, which brings their conscious activity and development, i.e. advance in work. Distance learning gives the chance of gaining new skills and qualifications, as well as developing in the new ones. A better result and better performance are achieved by rational changes in teaching methods, which lead to a more rational teaching process.

The success of the implementation of distance learning depends on users’ capability to use information technologies, i.e. the level of their information literacy.

The obtained results confirm the sub hypothesis H1 – respondents do have solid knowledge necessary for work on computers and mastering the distance learning course. Vast majority of respondents (97%) know how to work with files and folders, 99% of them knows how to save and find either files or folders, while 95% of them is capable to simultaneously have a number of opened applications and switch between them. The number of the respondents knowing how to install software is 83%, and the number of those who know how to solve possible problems occurring while working on computer, as well as seek necessary help from professionals is 74%.

Although the latter two statements have slightly lower results than the former three, it can be concluded that the respondents do have common knowledge for working on computers and are able to participate the LDC.

Acquired results also confirm the second sub hypothesis H2 – respondents do have necessary knowledge about Internet and its use, according to the following results: 97% of them know how to connect to the Internet, 82% knows to download items, and 88% to search. The number of respondents who know how to use web browsers is 92%, while 70% of them can change their settings. A very small number, only 19% have their own web page. Based on the obtained results, it can be concluded that the respondents have common knowledge of working on the Internet.

The obtained results, in total, show that the users are information literate and therefore able to participate the LD course, which confirms the main thesis of this research.

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Post-Transformation of Classical Photograph into Infrared Black and White Photograph

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Abstract – Infrared photograph is obtained using certain photo techniques. The automatic transformation of classical photograph, obtained from classical analog or digital photo camera, into the infrared one does not exist. The paper presents the way of obtaining a very accurate infrared black and white photograph using the Adobe Photoshop tools. The basis for this is the experiment on certain objects' luminosity ratio on classical and infrared photograph. Based on the ratios obtained and the techniques developed in Photoshop, it is possible to transform a photograph into one which strikingly resembles to the infrared. The example given shows the classical photograph transformation into the infrared black and white one.

I. INTRODUCTION

Infrared (IR) waves are invisible to the human eye, but they can be recorded using the film or digital photo camera sensor, depending on the photograph type used (previously analog-only, today mainly digital) [1]. The acquired picture is different with the use of infrared waves from the one acquired with the use of classical recording process and it can be either a black and white or color infrared photograph. The color one gives colors different from the normal colors seen by human eye and this is why the expression 'false color' is often used for this photograph type.

Making an infrared photograph usually requires expensive studio equipment, from the special, adjusted digital photo-cameras, over special IR films, to special analog laboratory procedure for obtaining this type of photograph [2].

Automatic transformation of classical photograph obtained with the classical camera, into the infrared one, does not exist. The reasons for this are presented in the Section two, where the description of objects' 'behavior' towards the infrared light is given.

Section three presents the experiment used for developing a technique which transforms the classical photograph into the very accurate infrared photograph. The technique itself is presented in Section four, and is developed for the photographs of sky and trees with leaves. Section five concludes this paper.

II. INFRARED PHOTOGRAPH

The history of infrared photograph goes back to the 1800, when it was discovered by a British astronomer Sir

William Herschel. Using the prism, he decomposed the visible light spectrum and using the thermometer noticed the existence of waves which have the greater wavelength than the red waves.

The term 'light' as we know it is in fact only the part of radiation spectrum that the human eye-brain system can capture. This spectrum area's wavelength is usually measured in nanometers (billionths of a meter). Color hues, as we see them, vary from about 400nm for violet over about 460nm (blue) to 540nm (green), yellow (600nm) and finally deep red (750nm). Beyond violet and below deep red there are radiations the human eye cannot see, i.e., ultraviolet (UV) and infrared (IR) – Figure 1 [3]. Even though invisible, these radiations certainly have effect on the human body. Far infrared (contrary to near infrared, being closer to deep red) is often felt as heat and - harmful UV rays.

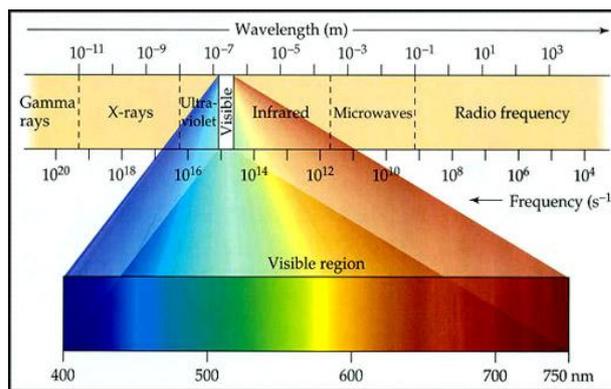


Figure 1. Spectral range

The focus of this paper is on infrared photography, a technique that can capture on film or on a digital sensor the IR radiation reflected by the scene we frame. Due to certain restrictions of films and camera sensors, IR photography captures IR radiation in the limited range between 750nm and 1300nm (in the case of digital sensors) and even less in the case of IR film [2], compared to the real IR range of spectrum, going from below a wavelength of 750nm and continuing down to 20,000nm or more.

Figures 2 and 3 [2] show the same objects in nature, recorded in visible and infrared light.



Figure 2. Black and white picture in visible light



Figure 3. Black and white IR picture with Hoya R72 filter

Infrared photograph is 1000 times wider than the classical photograph made in visible range of the spectrum.

The following experiment was used for developing technique which transforms the classical photograph of the nature with sky and trees with leaves, into a very accurate infrared photograph.

III. EXPERIMENT

For the purposes of this experiment, a total of 50 photographs were chosen, all showing sky and trees with leaves. Color photographs and infrared photographs were taken at the very same time and then compared. The aim was to establish what happens with the illumination of leaves and sky on color photographs, in relation to the infrared ones.

A. Measurement process

The experiment was conveyed in Adobe Photoshop, both on color and infrared photographs with the same content:

The sky was selected on color photograph and the Luminosity medium value was read from the Histogram. The selection was saved and copied into the infrared photograph.

- Then, the selection of the sky was also done on the infrared photograph and the Luminosity medium value was also read.
- The same was done for the leaves on both photographs.
- Finally, the average ratio for the sky from color and infrared photograph was calculated. The same was done for the leaves, with the special attention to the difference between the yellow and green leaves.

B. Results

The results were obtained as follows:

- The sky on infrared photograph has about 30-50% of Luminosity of the sky on classical photograph.
- Yellow leaves on infrared photograph have about 120% of Luminosity of the leaves on classical photograph.
- Green leaves on infrared photograph have about 200% of Luminosity of the leaves on classical photograph.

These data were used for development of the false infrared photograph technique.

IV. THE TRANSFORMATION TECHNIQUE OF A COLOR PHOTOGRAPH INTO A VERY ACCURATE INFRARED BLACK AND WHITE PHOTOGRAPH

The aim of this photograph transformation is the transformation of light – Luminosity medium value for sky and leaves. Based on the experiments and using the technique obtained from [4, 5], the technique shown on the following example was developed.

For the example of using the technique which can be called ‘pseudo infrared black and white photograph’, the photograph called ‘Spring’ from 2007 was used. It was recorded with the digital photo camera and shown in Figure 4 in its original version.



Figure 4. Spring

If this photograph were converted into the black and white one, using the usual conversion tools, the following result, shown in Figure 5, would be obtained.



Figure 5. Spring in grey mode

The photograph looks usual, with slight contrast. The following procedure was then applied to it:

On the basis of experiment's results, the illumination of certain parts of the photograph was changed. Firstly, the Channel Mixer tool – Selective Colors was used (Figure 6) on precise selections of sky and leaves.

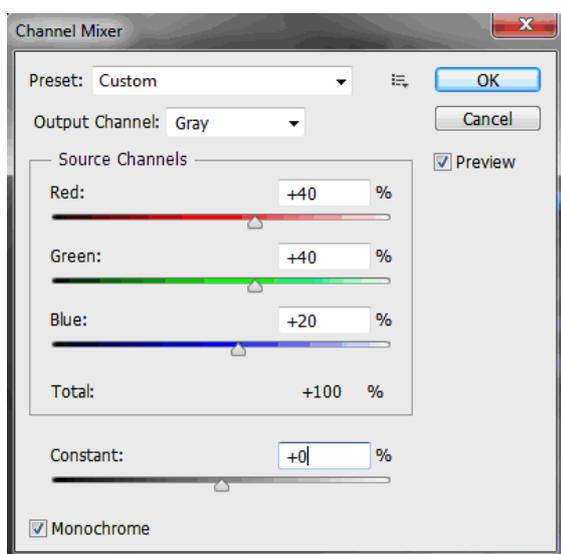


Figure 6. Selective Color

The further processing of this photograph included the partial alighting of the area around the bird and upper left angle for the better contrast with the background. Remaining angles were partially darkened with the Vignette option (Figure 7). Finally, the classic

Brightness/Contrast and Levels tool was used for making the final outlook of the photograph.

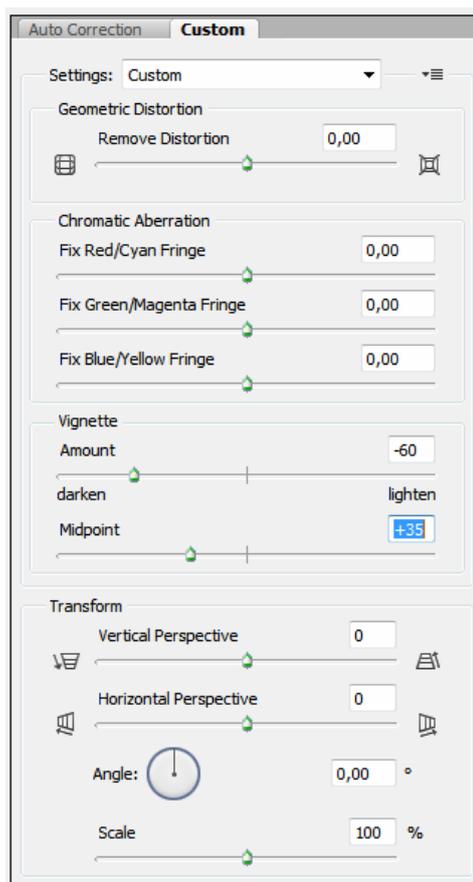


Figure 7. Selective Color

The black-white film effect can be added, but it is optional. This is done by duplicating the background layer and applying the Gaussian Blur filter. This layer is made partially transparent.

The grainy effect occurring on classical infrared photographs can be gained using the Noise filter or various plug-ins in Photoshop. If the photograph seems to be insufficiently sharp, the Unsharp Mask tool (filter – sharpen – unsharp mask) tool is used.

The goal set – changing the illumination of the sky and leaves in certain percent – was measured and checked several times during the transformation process.

The final result, represented in Figure 8, is a really interesting photograph looking similar to the real infrared photograph.



Figure 8. Spring – infrared photograph

V. CONCLUSION

This paper showed obtaining a really accurate infrared photograph on the basis of the classical one. The transformation process was shown on the basis of experiments and developed technique.

This paper should continue with the comparison of the transformed photograph to the real infrared one. The technique shown could be estimated with greater precision if the larger number of transformed photographs were compared.

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Potentials of Using Data Mining in Basketball Coaching

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Abstract - In the times past, basketball statistics used to be a luxury, available only to big professional teams. For the average coach, statistics was a nightmare: it required a great deal of time and effort, first at collecting statistical data, then in manual computing various joint statistical parameters. For most coaches, statistics was simply not worth the effort. We live in an information world today. Basic characteristics of information, defining its quality, are: precision, completeness, comprehensibility and timeliness.

I. INTRODUCTION

Basketball is the one of most popular sports, in Serbia and in the world. It is a team sport. Actors of a basketball game are the players from two opposing teams, their team officials with coaches, assistant coaches, doctors and officials (commissioner, referees, table officials, statisticians). Every team, depending on a league or competition, may have no more than 12 or 10 players per game, and of those 5 are actively engaged in the game [1]. Basketball game would not start without 5 players from each game on the court. In Europe, regular basketball game is divided into 4 quarters of 10 minutes each, while in NBA every quarter is 2 minutes longer. If a result is draw, after regular time additional time of 5 minutes is played, as many times as necessary to decide a winner of a game. . Every team in the NBA had four statisticians, keeping track how a team is doing in offence and in defense. In those times, basketball was more oriented to offensive activities than defensive ones. There was even a name for such type of basketball: "Run and gun". For the average coach, statistics was a nightmare: it required a great deal of time and effort, first at collecting statistical data, then in manual computing various joint statistical parameters [3]. For most coaches, statistics was simply not worth the effort.

At the beginning of a season, coaches are mostly interested in using different statistical reports for analyzing and evaluation of individual players. Once they have insight into advantages and flaws of their players, their interest is moving towards the team as a whole. They want to know how good a team is. The team statistics therefore becomes most important. After all, a basketball

is still a team sport. And finally, having in mind that different statistic reports may be used also for analyzing opponent's play, during a season coaches' interest is moved towards their opponents. More often than not, well analyzed opponents' play means a difference between winning and losing [2].

Coaches are not the only ones to use statistics. On the contrary, whole population of sport fans and audience is able, using mass production of technology and media as TV and Internet, to follow efficiency of teams and individual athletes. To many people, as reporters and commentators, statistic is an important tool in doing their job, and for some, as sport managers, it is a vital part of their profession. After all, during last decades sport became more than a game: it is a large business, with considerable amounts of money invested [3].

II. THEORETICAL BACKGROUND

According to [9], "Data mining is a process of discovering new sensible correlations, patterns and guidelines by observing a large amount of information stored, and by using pattern recognition technologies and statistical and mathematical techniques". There are also other definitions:

- "Data mining is the analysis of (mostly large) observed data set in order to find certain connections and to sum up data in new ways, being intelligible and useful to the data owner" [10].
- "Data mining is an interdisciplinary bough merging techniques from machine learning, pattern recognition, statistics, databases and visualization, in order to solve the question of obtaining information from large data bases" [11]

The third type approach is the one when experts start using collected data. Decisions on this level include playing with certain players, for which it was proven that they cooperate well and using actions that score points more often.

The fourth type of approach includes statistics in decision-making process. These statistical measurements may be simple, as measurements of frequency for certain events, or complex, which divides performance of a whole team and assigning merits to each player in given game or a league. Statistics is used as a tool, helping experts in making correct decisions. [12, 13]

The fifth type of connection between sports information and their use is using the data mining techniques. They do have potential to help predictions. Statistics techniques are still in the core of data mining, but statistics is being used to separate a pattern or any other behavior of interest (tendencies of opponent players) from the background noise. Statisticians do not explain relations within data, since this is a point of data mining. This type of approach has a potential to be used in order to help expert to make appropriate decision or to be used independently in order to make decisions without experts. Use of data mining techniques without human influence is often exempted from certain errors. For instance, a scout may especially appreciate certain qualities in a player, neglecting some flaws. Most of sports organizations use the third or fourth type of approach between data and their use, and only a few use data mining techniques. Although data mining was introduced in sport relatively recently, results of teams who apply these techniques are exceptional [14].

III. SYSTEM DESCRIPTION

Aim of this system is partly to generate reports after game is finished. This may not be directly after the game is over, but also in a consequent period. Therefore, one of functions necessary for the system is a permanent storage of information. This is accomplished by storing information in a database. After every input by user, action is saved into a database. In this way a potential problem of power shortage during a game is solved or any other problem of a similar nature.

Implemented system consists of three applications: main application (BSV) used to collect statistical data during basketball game in Firebird relational database, Uploader application used to send data to central web server over FTP [8] and web application used to show statistical data from following game. BSV and Uploader applications are programmed in C++ programming language, while web application is programmed using PHP, HTML and JavaScript.

IV. GOALS OF A MODERN BASKETBALL STATISTICS , COACHING AND SCOUTING SYSTEM

By analyzing other aims of this system and having in mind all that is presented in this section, we will give a short review of functions that a system should have:

1. Collecting statistic data by keyboard input of actions by user. Input must be quick and precise.
2. In order to enable input of actions, there must be possibility to create in advance a new game, including definition of basic data about it.

3. Possibility to open existing game from a database, with potential proceeding of new actions input or changing basic data regarding the game.
4. In all these cases, possibility to generate (show and print) dynamic statistical reports. Word "dynamic" means possibility to generate report at every moment during a game (both during and after a game).
5. Possibility to update data about all actors in a game from database. Updating means possibility to add new actors, change data about existing actors and deleting actors.
6. User friendly system with textual and graphic forms of help.
7. System stability and precision in processing and presenting data is understood, and it is also desirable that a system is easy to use.
8. Possibility to send statistical data to central web server and to show this data to viewers over the internet.

V. SCOUTING AND DATA MINING TECHNIQUES

The main reason for scouting is to know the opponent in all stages of basketball. Scouting is done at team and individual level. Team level reviews opponents systems of playing the game in offense, defense and transition; how the team acts in all kinds of defense, how it attacks after outs and how it transits from defense to offence. [5] Every stage may be statistically shown as number of tries, lines of offense and percentage. In addition, good and bad sides of team's and individual game may be shown. Individual scouting reviews performance of every individual player in all game stages, his statistical performance, his good and bad sides. For example, from which action he attacks most frequently and most successfully or in which actions he has lower performance, as well as in how he (or she) performs in different kinds of defense (what he defends worst?) [4]

Scouting shows how to attack the opponent in most efficient way and how to handle defense. Therefore, statistics and scouting are important part of every analysis required in order to prepare for future games. A good scouting often requires to follow several games of the opponent team, mostly last four (two at home and two away). This requires exceptional knowledge about basketball and computers as well. Scouts often need several days to prepare players and coach for the next opponent. With present rhythm, playing games twice a week (Wednesday – Sunday), scouts often don't have enough time to cover all opponents, so some teams have two or even more scouts in order to analyze every next opponent. Naturally, there is a question of a mean to shorten the time for the scout, but in such a way that he still obtains good quality information that will provide advantage over the opponent. There is a powerful and good-quality tool today: "data mining in sport" techniques. Data mining techniques in sports, especially in basketball, are in rise recently. Those tools and techniques are developed with the aim to measure performances of

individual players and of the team as a whole. Since the sport is one of most profitable industries, these methods, as well as performances of players and teams, attracts much attention of sport clubs and managing companies. Before data mining and its advantages, analysis of opponents, as well as preparation of tactics for the game, was a task of professional scouts. Since the number of games constantly increased, and scouts could not manage large number of games and corresponding amount of information, new methods were sought in order to extract knowledge from raw data. Every team could choose between two ways. One was to engage professional statisticians who had deep knowledge about concrete sport, in his case basketball, and who would enable the team to reach right decisions. Other way was to find methods that will shorten the time, and still provide precious knowledge; in other words, to start data mining techniques. When appropriately used, data mining techniques may result in better preparation of the game, and better performances of the team and players. This means that players may be prepared for certain events that may occur at the game, using all downsides and flaws of the opponent team.

In order to analyze the opponent, we need information. Knowing individual qualities of players and their habits,

in both offence and defense, we may easily predict where advantages or problems will occur in individual situations at offence and defense. Having this in mind, we will pay more or less attention to certain segments of opponent's game, thus reducing the number of information and allowing all players of the team the clear and identical idea how to play that game. When number of misunderstandings decrease, power of team play rises. Therefore for appliance of data mining quality and precise data are necessary. One of definitions in FIBA manual [6] is: Basketball is a complex game between two opposing teams with the aim to score most points and win. During the game, a vast number of events occur, and it is very hard or even impossible to note them all. Besides basic events as shots, assists, turnovers and steals, offensive and defensive rebounds, there are a number of relevant events such as movements of player across the court, shown on Fig. 1, with and without the ball, a type of defense played by a team, and which player is the weakest point in which defense. We must emphasize that there are measurable and non-measurable part in statistic [7]. Measurable part is the one that may be presented in statistics, but there is also a part that is not noted anywhere, for instance the last good defense, last wrong foul, last turnover, steal etc.

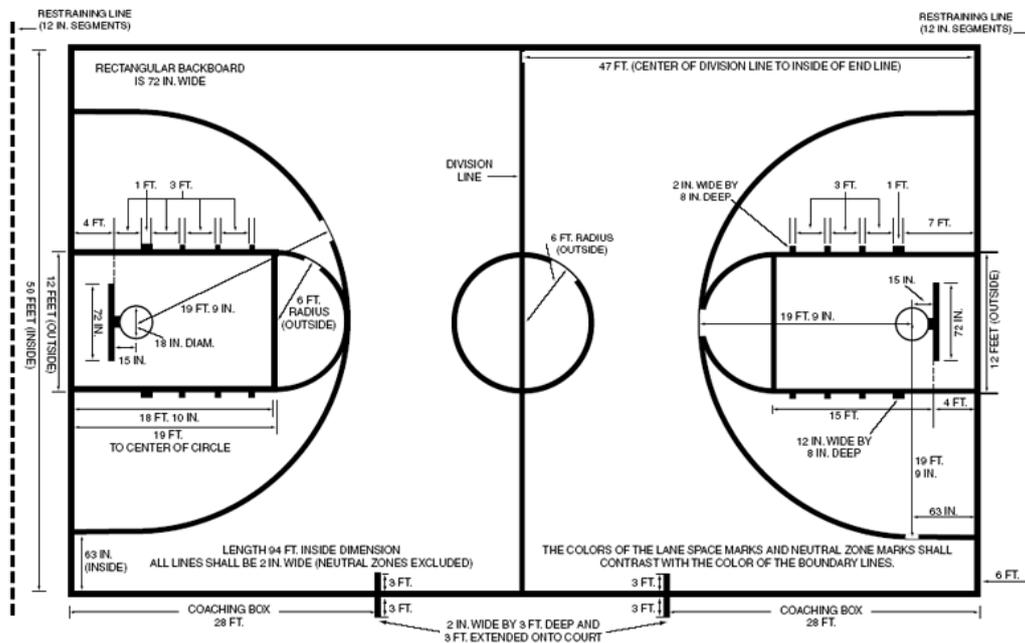


Figure 1. Division of a basketball court

This is of utmost importance since we may know how players, or a team, shoot for two or three points. By using data mining techniques, we consider influence of shot from certain positions in a field and in general. Influence of all gathered parameters is considered (shots for one, two and three points, offensive and defensive rebounds, turnovers, steals, assists, blocks). By using these technologies, models are created in order to predict the result of the game.

VI. CONCLUSION

Some of improvements possible are already mentioned in a paper, regarding widening set of statistic elements, corrections of time intervals, realization of interface for mouse data input and generating new statistic reports. Additional improvements could be found in an error-avoiding part in case of wrong data input by user. System offers action delete, and further improvements would be possible regarding changing already entered actions, inserting new ones between already existing ones and changing sequence of entered actions.

Good preparation for the game may mean the difference between the average and best results. Scouting opponents is an important and indispensable element in these preparations. Scouting targets are not only players or team game, but also coaches, who usually have consistent approach to the game (coach philosophy). Use of data mining techniques provides knowledge about individual qualities of players and their habits, in both offence and defense, so it is easier to predict where advantages of problems will occur in individual offence or defense situations.

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Thinking of Maintenance During Software Development: A Preliminary Review

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Abstract - Software maintenance is the most expensive phase in software life cycle, which is evident from available literature and reports from software industry. It is usually related to modification of software systems after initial delivery into clients' business environment. However, effective maintenance requires taking into account typical issues that occur in software maintenance during software development stage. By considering these issues, maintainability of software systems could be significantly improved. The aim of this paper is to identify influential software maintenance and maintainability articles. The search includes the leading international conferences and journals. This study could be classified as a preliminary literature review with the aim to identify the relevant literature for the practice in the field. Further research will be directed towards conducting the more comprehensive systematic literature reviews on software maintainability.

I. INTRODUCTION

Many papers have been published on the topic of software maintainability and software maintenance in general. However, it is difficult to assess the current status of the research and industrial practice. In addition, there is a significant misunderstanding between the academic research and the industrial practice [1]. One of the possible directions that could help in overcoming these misunderstandings is production of comprehensive reviews of selected topics in the software engineering. These reviews should introduce the topic of interest and include the most relevant literature in the field.

Literature reviews have recently gained attention in academic community. Literature reviews have been published on the variety of the topics. The common approaches to literature reviews are implemented as systematic literature reviews and mapping studies [2]. The aim of these studies is to aggregate the research of other studies that are referred to as primary studies in the field.

The more focused literature review is presented in the article [3]. The authors presented the results of a systematic review conducted to collect evidence on software maintainability prediction and metrics. The study was based on 15 primary studies. The article [4] presents a review of several significant conference paper and journal articles on software maintainability in object-oriented system. The authors have included 21 papers and articles related only to object-oriented software systems. A

systematic review of literature on the effects of application of Unified Modeling Language (UML) in software maintenance is shown in the article [5].

The rest of the paper is structured as follows. The second and the third sections introduce the basic concepts of software maintenance. The fourth section contains the preliminary review of literature on software maintainability, while the last section contains conclusions and further research directions.

II. SOFTWARE MAINTENANCE

Problems in the systems functioning can be significantly reduced by the use of effective maintenance procedures and strategies. Maintenance in the context of engineering has a wide range of meanings and includes all activities related to the preservation of consistency and efficiency of complex systems [6]. The definition of maintenance according to standard EN 13306:2001 [7] is:

“Maintenance is combination of all technical, administrative and managerial actions during the life cycle of an item intended to retain it in, or restore it to, a state in which it can perform the required function.”

Software Maintenance is in the literature seen as the last phase in software life cycle (according to most life cycle models), which does not attract enough attention when compared with software development. As a result, maintained software contains more errors than the software after the initial delivery [8]. Developers and managers consider maintenance requests as short-term jobs that should be done as quickly as it is possible [9]. Most empirical studies that deal with software maintenance are focused on different aspects of software changes during maintenance. In many studies on software maintenance (such as a study on predicting changes in software [10]) maintenance request is identified with a change request.

Researches suggest that most of the costs of software systems occur after the initial delivery, i.e. in the maintenance phase [11][12][13][14][15]. In the literature can be found evidence that the maintenance costs are between 40% and 90% of the total cost of the software life cycle [16]. Maintenance costs for systems that are very long in use many times exceed the costs of development phase [17].

The fundamental difference between development and maintenance of software is that development is requirement-driven, while maintenance is event-driven [18]. Users usually initiate maintenance process (clients or a market in a broader sense), but people who are engaged in software development and maintenance can also initiate maintenance process. Many activities in the maintenance can be found also in software development (modeling, coding, testing, documentation). However, there are activities that are characteristic only for maintenance phase such as migration, withdrawal or retirement of software. Activities in a typical software maintenance process are shown in Figure 1.

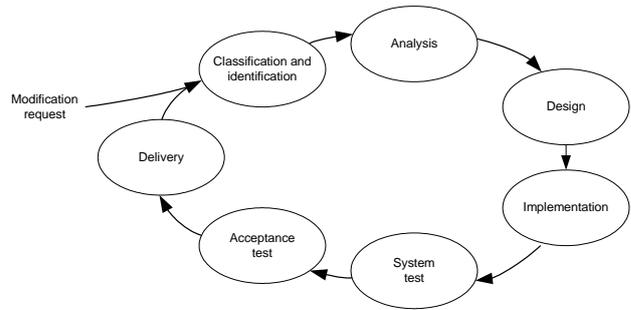


Figure 1. Activities in a typical maintenance process [14]

Activities within the maintenance process are specific to organizations that implement them. The diversity of maintenance processes and activities depends on the domain where software is used, software size, frequency of changes, and limitations in the work schedule, resources and budget [19]. The complexity of the maintenance process arises from the following facts [20]:

- It is implemented on complex software systems.
- It includes people who have different roles in the process.
- It contains more loops that ensure flow of information between participants in the process.

III. TYPES OF SOFTWARE MAINTENANCE

A comprehensive classification of maintenance types, defined in the standard EN 13306:2001 [7], is shown in Figure 2. The main types of maintenance after the initial delivery to customers are preventive and corrective maintenance [21]. Preventive maintenance aims to reduce the probability of failure or degradation of the functional characteristics of the product. Corrective maintenance occurs after discovering the problem and aims to return the product to the state that can provide the required operation. Swanson proposed the first typology of software maintenance [22]. According to that typology the basic types of software maintenance are:

- *Corrective.* Maintenance that is performed to eliminate errors in the functioning of software.
- *Adaptive.* Maintenance that is undertaken in order to adapt software to remain usable in a changed environment.
- *Perfective.* Maintenance that is undertaken in order to improve performance, maintainability, or other characteristics of software product.

This typology was later amended in Standard for Software Maintenance, ISO/IEC 14764, to include preventive maintenance with the following definition [23]:

Preventive maintenance is the modification of a software product after delivery to detect and correct latent faults in the software product before they become operational faults.

The results of empirical study [24] on the factors that determine the maintenance activities indicate that there are predictable patterns in software maintenance. These

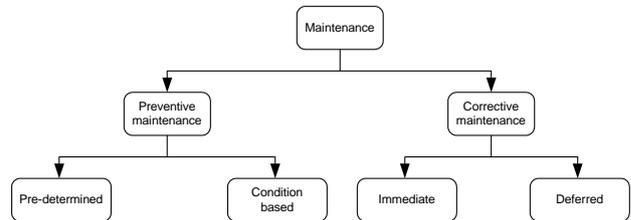


Figure 2. Types of maintenance according to standard EN 13306:2001

results confirm that the appropriate management and planning methods can improve various activities in the maintenance process.

IV. SOFTWARE MAINTAINABILITY

The main problem in the software industry is the high cost of software maintenance. It is therefore necessary to develop efficient methods of software maintenance and development that can facilitate the maintenance activities [25]. Practically, during development should be planned future improvements or extensions of the system with the aim of increasing maintainability (the ability of maintaining) [11][26][27].

Software maintainability is the ease with which a software system can be modified. Maintainability is software quality attribute associated with the maintenance process. The maintainability of a software system can significantly impact software costs, especially in the maintenance phase. Design and architectural principles significantly influence the maintainability of a software system. However, such principles change over time. Therefore, it is very hard or probably impossible to establish the definitive criteria for assessing maintainability.

Most research on maintainability focuses on individual classes of individual systems [28]. The following quotation from [28] illustrates the importance of thinking about maintainability during software development:

From the point of view of a software development organization, it may be most economically beneficial to spend few resources on developing maintainable and extendable software initially, and then achieve higher earnings from providing costly extensions in the maintenance phase.

Anda [28] presented an empirical study in which the maintainability of four functionally equivalent systems developed in Java was assessed using both structural measures and expert assessments. The results showed that

assessments of maintainability based on structural measures and those based on expert assessments have a lot in common. However, many potential maintainability problems are difficult to detect using only structural measures.

In the article [26] are explored factors that influence the timing and the performance of the maintenance process. Factors that have the greatest impact on maintenance performance are the number of users, system size and age of the system. The study presented in [26] also indicates that the use of modern development methodologies results in more reliable systems that require less maintenance activities.

According to Anan et al. maintainability can be seen on the next two levels [29]:

- *Source code level.* At this level maintainability is reflected in cognitive complexity of source code.
- *Architecture level.* At this level maintainability is estimated on the basis of the components, their interconnections and the overall structure of the application.

Maintainability is also reflected in the level of support for change, and it is based on series of questions related to the process of change management identified in the article [30]. These considerations suggest that the effective management of change requests is a key aspect of maintainability, both for the organization that develops and maintains software and for its users.

To avoid intuitive problem solving in the maintenance phase, which usually gives inappropriate results, it is important to adopt a methodology that will be consistently applied from the early stages of development [13]. Understanding the factors that influence the development not only helps in reducing the number of the incidents during the use of software, but also provides a higher level of maintainability [31]. In practice, there is no generally accepted measure of maintainability. Although maintainability has been treated as an essential characteristic of software, in practice most organizations do not in fact monitor it [32].

During development of software systems, analysis of potential changes in the maintenance phase is often not considered, or it is treated as an unfortunate fact of life [33]. Software that is designed for a specific purpose in an organization can become unusable if there is a change in the organization, or even can become problematic for its business [34][35].

V. CONCLUSION

This paper aims to identify influential software maintenance and maintainability articles based on the search that includes the leading international conferences and journals. However, the authors are aware that there is a possibility to omit some articles, and this shortcoming should motivate the promising further research direction: How to conduct the most relevant literature search for the selected field?

This review presents the selection of relevant work in the field of software maintainability. Both researchers and practitioners from industry as a starting point in searching for the relevant literature for the selected topic, or as the basis for starting more comprehensible literature review could use this preliminary review.

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The Quality Aspects of the Educational Web Applications

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Abstract - Quality aspects, are of foremost concern while testing Educational Web-based systems. Since the focus of conventional software testing approaches is mainly on functionality, this marks an importance shift towards non-functional or quality aspects. Quality of the web sites was measured by the assessment instrument that was based upon established methodology for evaluation of the web sites. The objective of the described research in this paper is to evaluate defined students' assignments and determine the impact of implemented introduction of the heuristic for developing web applications that have satisfying quality. The aspects included in the methodology were Efficiency, Navigability, Content suitability, Accessibility, Representation and Standard conformance. The assessment instrument incorporated those aspects through numerous criteria in the form of relevant characteristics.

I. INTRODUCTION

Rapid development and evolution of web technologies, their specific and general usability, easy understandable and applicable HTML standard, variety existence of web browsers and their features and some of many causes that implicate unsatisfactory quality of web applications [1].

The term "quality" itself is defined as "the totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs. Not to be mistaken for "degree of excellence" or "fitness for use" which meet only part of the definition" [2]. A quality aspect is therefore a particular component or feature of quality or a particular way in which quality may be considered. Common synonyms for "quality aspect" are the terms "quality attribute" and "quality characteristic". In this paper the term "quality aspect" is preferred to stress that quality also implies a certain point of view from which the system under test is approach. The term quality attribute respectively quality characteristic is used to describe a certain facet of quality in general.

Nowadays, World Wide Web service is used in many areas and various populations. Quality of web applications can be observed from many different points of view [3]. In this research we identified users' point of view and developers' point of view. Conducted research combines those points of view. Conducted research combines those points of view and on those bases specifies certain criteria for establishing methodology approach for evaluation of web site applications with educational contents.

II. THE THESIS

Hypertext Markup Language is a standard language for World Wide Web [4]. HTML is not difficult to learn and is available to wide range of the users who are developing different kinds of web sites [5]. Considering and adopting known established heuristics in the process of developing web sites is of great interest for developing Web sites that satisfying quality [6], [7].

Often, the quality aspects named are used as broad categories for corresponding tests. It is common practice to talk about usability testing, compatibility testing, security testing, performance testing, and availability testing, referring to tests without exactly specifying which system features and which quality aspects are affected in particular, respectively which test methods and approaches are applied. Moreover, these different viewpoints – features, quality aspects, and test methods – are sometimes mixed up and named along likewise without distinction. In practice, the difference between these viewpoints is not as clear as it appears in theory anyway; let alone the distinction between functional and non-functional requirements [8], which largely depends on the level of detail of the specification of the requirements. Nonetheless, it is useful to be aware of the different perspectives to ensure that Web testing follows a systematic and comprehensive approach. Therefore, concepts that support planning and design of tests for Web-based systems considering quality aspects are required.

Web testing is described by focusing on quality what enforces the impression that the area of Web testing has little in common with conventional software testing. Software testing has a long tradition emphasizing mainly functionality, although the influence of aspects like performance or usability is well known and software development practice is positively aware of them. For Web testing it seems as if the situation has slightly changed. The figures presented by Fisher [9] underline this impression and foretell a shift quality aspects.

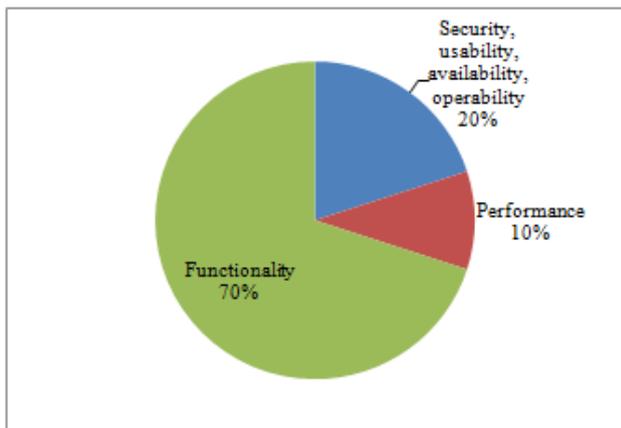


Figure 1. Traditional IT

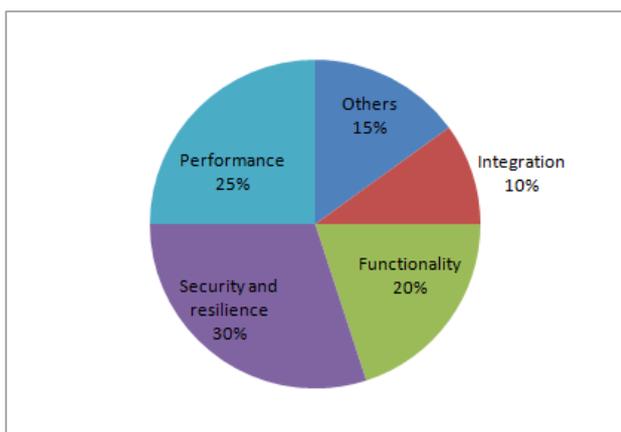


Figure 2. E-Business

Fisher presented the following figures underpinning the assumption of a shift in testing priorities: Testing efforts for traditional IT split into tests of functionality (70%), performance (10%), and security, usability, availability, plus operability (all together 20%). E-business testing, in contrast, focuses on security and resilience (30%), performance (25%), functionality (20%), integration (10%), and others (15%). An overview of aspects relevant for Web testing derived from various sources including news groups and discussion forums is outlined in a previous report revealing, too, an emphasize of quality aspects in the ongoing discussion about testing of Web sites and Web applications.

For this research we have created two groups of students that attended course in developing web sites. Students were assigned to create and develop web sites that contained educational content. The first group was the Control group and it was introduced to various technologies that were being used for creating and developing web sites. The second group was the Experimental group that was introduced only to these

technologies but also to known heuristics for developing satisfying web site.

Our research was meant to affirm thesis that the introduction to the heuristics and software product quality standards [10] can be reflected in larger quality extent of web applications.

III. THE METHODOLOGY

The methodology for assessment approach to the created web sites was established. This methodology was based upon different literature resources [3], [5], [11] and [12]. The Methodology was intended for evaluation of the educational web sites.

The following aspects were selected as relevant aspects for observation of the finished students' assignments: Efficiency, Navigability, Content suitability, Accessibility, Representation and Standard conformance. Every one of the chosen aspects has a set of the relevant characteristics that was considered as crucial for assessing the quality of educational web site.

Effectiveness is defined as the accuracy and completeness with which users achieve specified goals; efficiency is defined as the resources expended in relation to the accuracy and completeness with which users achieve those goals; and satisfaction is defined as "freedom from discomfort, and positive attitudes towards the use of the product (system, service or environment)" [3].

Based upon above mentioned methodology an instrument was developed and applied in assessment of student's assignments. The instrument was used to determine in what extent student's assignment – Web site – has been successfully accomplished.

The instrument consisted of the information about the author(s) of the web site, the heading of the educational content that was presented in the student's web site, the short description of the target users, the date of the evaluation and the name of the evaluator.

The instrument was measuring characteristics that were within aspects of the established methodology. Some of the characteristics for the aspect of the accessibility are: Is there a declaration of <meta> tag; Is there declaration of <title> tag?; Is there a search option for searching the web site; Is there a defined map that clearly describe navigation on the web site and structure of the web site.

Some of the characteristics for the aspect of the efficiency are: Are the links on the pages reliable; Are there any broken links; Are there any links to the information outside the student's web site; Links are labeled.

Some of the characteristics for the aspect of the navigability are: User interface options are logically grouped; Is it clearly indicated to the user where certain page in the hierarchy of the web site structure is; Is it understandable for the user how web site is organized.

Some of the characteristics for the aspect of the content suitability are: Is the content of the web site in a suitable form for the intended target users; Does the

content has grammatical and spelling correctness; Is there indication on pages of the date of the content creation; Is there indication on pages of the updating the pages.

Some of the characteristics for the aspect of the representation and standard conformance are: Is used HTML standard compliant; Are the other techniques on the web site adequately used and standard compliant; Is the representation of the links on the page visible and clear; Are the used graphics and multimedia elements on the web site in adequate format and resolution.

These are some of the characteristics used in the assessment for the evaluation of the students' web sites, other characteristics are stated [13].

For every characteristic in form of criterion it is foreseen that it would be applied or not applied or not applicable. Scale ranges the web sites as the web site of the satisfying quality, web site of the acceptable average quality or web site of the unacceptable quality. To rang student's assignment as a web site of the satisfying quality web site must have applied more then a half of characteristics for the aspect of accessibility, all the characteristics of the aspect for the content suitability, most of the characteristics of the aspect of navigability, all the aspects for efficiency, except the characteristics of existence of the broken links, which must be not applied, and full standard compliance and representation conformance for the elements that are applied in the student's web site. General impression of the evaluator must be that the evaluated site has satisfying quality. To range student's assignment as a web site of the acceptable average quality it must have applied selected characteristic for the mentioned aspects of the assessment [13]. And the evaluator's general impression can be that the evaluated web site has satisfying quality or average quality. To range student's assignment as a web site of the unacceptable quality is the web site that has not applied characteristics of the specified aspects in the assessment instrument [13]. And the evaluator's general impression on evaluated student's assignment can be that it is a web site of the unacceptable quality or average quality. The evaluator's impression about web site can be different from the measured quality extent with applied assessment instrument. In the defined assessment instrument it is allowed to the evaluator to state his impression about evaluated web site.

IV. THE RESEARCH RESULTS

The results of the research were affirmative regarding the stated hypothesis. In the Control group results in total of the students' assignments were as they are presented in Table I:

TABLE I.

The Control group		
Assignments quality		% of total
Quality scale	satisfying quality	9.37%
	acceptable average quality	43.75%
	unacceptable quality	46.88%

- 9.37% of the assignments were web sites of the satisfying quality,
- 43.75% of the assignments were web sites of the acceptable average quality,
- 46.88% of the assignments were web sites of the unacceptable quality.

In the Experiment group results in total of the students' assignments were like presented in following Table II:

TABLE II.

The Experiment group		
Assignments quality		% of total
Quality scale	satisfying quality	47.92%
	acceptable average quality	39.58%
	unacceptable quality	12.50%

- 47.92% of the assignments were web sites of the satisfying quality,
- 39.58% of the assignments were web sites of the acceptable average quality,
- 12.50% of the assignments were web sites of the unacceptable quality.

On Figure 3. comparative view of the assessments results is shown:

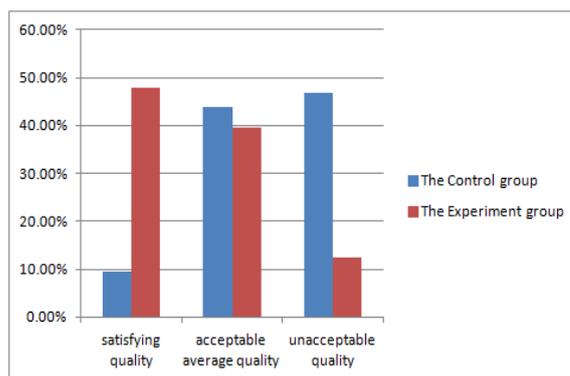


Figure 3. Comparative view of the research results

The Experimental group had 38.55% of total students' assignments more that were assessed as web sites of the satisfying quality in comparing to the Control group. Also The Experimental group had 34.38% of total students' assignments less that were assessed as web sites of unacceptable quality. The assignments that were found as web sites of the acceptable average quality were created for 4.17% more in the Control group.

Conclusion of the research is that introducing students not only to the techniques for developing of the web applications, but also to the heuristics for the development of the web applications with satisfying quality features has noticeable impact on the quality of the developed web applications.

V. CONCLUSION

This paper presents a methodology for the quality assessment of educational web sites, as well as the application of this methodology. Important conclusions were drawn about each method's requirements, the way in which each method approaches the problem, their advantages and disadvantages and, furthermore, their suitability for a complete quality assessment. The research results have affirmed that the introduction to known heuristics, standards and metrics are very useful in learning the development of web applications – in this case web sites with educational content. As much as it is important to learn and deploy standard technologies for the development of web applications it is crucial to implement into the creating process recognized quality demands that can be integrated in the process of learning standard technologies for web application development and yields more quality satisfying web applications.

ACKNOWLEDGMENT

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The Selection of the Essential Elements of SCORM Standard

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Abstract - The paper presents model of distance learning (DL) system based on SCORM Version 1.2 Standard. Mandatory elements, as well as some optional elements are listed. The elements of the DL system and their interaction are proposed. The SCORM standard is focused on enabling the plug-and-play interoperability, accessibility, and reusability of Web-based learning content, with the ultimate goal of ensuring ubiquitous access to the highest quality education and training, tailored to individual needs, and delivered cost-effectively anywhere and anytime. These standards are stimulating the rapid development of learning repositories. Once deployed, these have the potential of dramatically changing the use of e-learning in education. In this paper, some essential elements of SCORM standard are selected. The selection of the essential elements is elaborated. The concepts of absolute difficulty of the learning materials and relative difficulty of learning materials from student's standpoint are introduced.

I. INTRODUCTION

In recent years, distance learning (DL) is increasingly gaining in importance. The Department of Defense (DoD) established the Advanced Distributed Learning (ADL) initiative to develop a DoD-wide strategy for using learning and information technologies to modernize education and training. ADL SCORM standard provides the only standard that will be used for the internal needs of the Ministry, as well as publicly presented. SCORM Version 1.2 (The Sharable Content Object Reference Model) [1] was published in October 2001 and defines the reference model of shared resources for online learning. It contains a set of technical specifications that must be fulfilled in order to enable Web-based learning of shared resources. SCORM was developed based on the concept of using a common standard for learning, to modernize the training process. SCORM tools and platforms have the ability to find, use and share of resources via a Web-based learning systems [2]. Standard provides a set of specifications for the development, packaging and distribution of educational resources, which have a feature that they are:

- Easily accessible to students and those who develop the system.
- Interoperate - available on various hardware and software platforms and Web browsers.
- Permanent - does not depend on the version of the system changes.

- Easily changeable - can be easily modified using a variety of tools.

SCORM compatible programs can be used as components of more complex DL systems, thus offering additional quality.

II. ARCHITECTURE OVERVIEW OF THE SCORM STANDARD

SCORM standard prescribes the requirements that the elements of distance learning systems must meet in order to be SCORM compatible. The elements of this system are:

- Learning Management System (LMS) – provides API (Application Program Interface) adapter as a DOM (Document Object Model) object. (Conformance Label: LMS-RTE1, SCORM Standard).
- Sharable Content Object (SCO) – shared content objects, executed by LMS (Conformance Label: SCO-RTE1, SCORM Standard).
- Meta-data – are formed via an XML document (Conformance Label: MD-XML1, SCORM Standard).
- Content Packages – If the Content Package is contained in a Package Interchange File (PIF), the PIF shall be compatible with PKZIP Version 2.04g (Conformance Label: ADLCP-PIF1, SCORM Standard).

LMS system runs SCO elements automatically or through the user interface [3]. The user can control the application via the application menu, table of contents or the soft keys. SCORM LMS API is how the SCO communicates with the LMS. SCORM standard, strictly determines API function names, data types, error codes and error messages [1]. When starting SCO element of LMS, SCO seeks API adapter element and performs at least two API functions: LMSInitialize() i LMSFinish(). Meta-data are divided into mandatory and optional.

The paper is organized as follows: after Introduction, the second section gives a brief description of the SCORM standard. The third section is crucial: some mandatory elements are listed, and the essential elements are selected. The selection of essential elements is elaborated in this section. Section four gives some conclusions and future work guidelines.

III. ESSENTIAL ELEMENTS OF DL SYSTEM ACCORDING TO SCORM STANDARD

DL system consists of elements from Figure 1. Learning Management System (LMS) interprets the contents presented with Sharable Content Object's (SCO) through API functions, and generated XML content to a user via Web Browser. The module provides the selection of content according to [4]:

- User's account. A user may belong to one of the following groups: administrator, student, teacher, and author.
- Curriculum.
- Global progress of students.

Figure 1. describes the global scheme of the DL system which has the following modules [5]:

- Content selection - selects content that will be displayed by user's account, curricula and global progress of students.
- SCO module - Sharable Content Object.
- Module LMS (Learning Management System), which represents the working environment of the system, SCO interprets content through an API (Application Program Interface) and generate XML documents.
- Hardware and software platform.

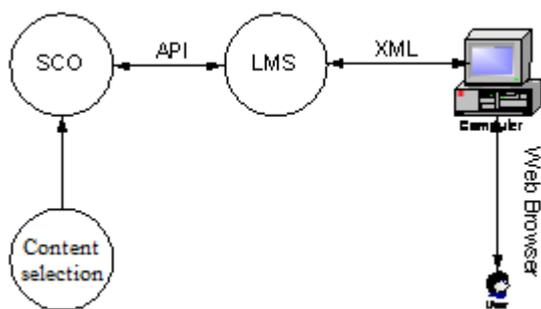


Figure 1. Elements of the DL system

User, via Web Browser access to the DL system. Table 1. contains the elements required by SCORM standard. The designations are defined as follows: 1:1 - element occurs once and only once, 1:M - element occurs one or more times, 0:M - element appears zero or more times. Abbreviations used are defined as follows: MIME - Multipurpose Internet Mail Extensions, URI - Universal Resource Identifier. In brackets "{}" are listed possible values of the elements when it's defined by the standard. Element <general> is composed of elements <title> <catalogentry>, <description> <keyword> and thus the general information of the content of the DL system, etc.

TABLE I. SHARABLE CONTENT OBJECT (SCO) CONFORMANCE REQUIREMENTS-MANDATORY ELEMENTS

<p><general> 1:1 <title> 1:1 <catalogentry> 1:M <catalog> 1:1 <entry> 1:1 <description> 1:M <keyword> 1:M</p>
<p><lifecycle> 1:1 <version> 1:1 <status> 1:1 {Draft, Final, Revised, Unavailable}</p>
<p><metametadata> 1:1 <metadatascheme> 1:M</p>
<p><technical> 1:1 <format> 0:M {MIME, non-digital} <location> 1:M attribute type: 1:1 {URI, TEXT}</p>
<p><rights> 1:1 <cost> 1:1 {Yes, No} <copyrightandotherrestrictions> 1:1 {Yes, No}</p>

<p><classification> 1:M <purpose> 1:1 {Discipline, Idea, Prerequisite, Educational Objective, Accessibility Restrictions, Educational Level, Skill Level, Security Level} <description> 1:1 <keyword> 1:M</p>
--

In many descriptions of DL systems the tendency to describe non-essential elements is present, while the description of essential elements is ignored. The main aim of this work is to select and extract these essential elements. As the variety of SCORM elements is overwhelming in many situations (all of them are not

needed always), Table 2. contains the proposal of optional elements of the SCO according to the table 2.1.3.2a of the SCORM standard. Element <general> is expanded with the elements <language> and <structure>, while element <technical> is expanded with <size> and <duration>, etc.

TABLE II. SHARABLE CONTENT OBJECT (SCO) CONFORMANCE REQUIREMENTS - SELECTED OPTIONAL ELEMENTS

<p><general> 1:1 <language> 0:M, according to ISO 639 and ISO 3166 <structure> 0:1 {Collection, Mixed, Linear, Hierarchical, Networked, Branched, Parceled, Atomic}</p>
<p><technical> 1:1 <size> 0:M <duration> 0:1</p>
<p><educational> 0:1 <interactivitytype> {Active, Expositive, Mixed, Undefined} <learningresourcetype> {Exercise, Simulation, Questionnaire, Diagram, Figure, Graph, Index, Slide, Table, Narrative Text, Exam, Experiment, Problem Statement, Self Assessment} <interactivitylevel> 0:1 {very low, low, medium, high, very high} <semanticdensity> 0:1 {very low, low, medium, high, very high} <intendedenduserrole> {Teacher, Author, Learner, Manager} <context> {Primary Education, Secondary Education, Higher Education, University First Cycle, University Second Cycle, University Postgrade, Technical School First Circle, Technical School Second Circle, Professional Formation, Continuous Formation, Vocational Training} <typicalagerange> 0:M <difficulty> 0:1 {very easy, easy, medium, difficult, very difficult} <typicallearningtime> 0:1 <description> 0:1 <language> 0:M, according to ISO 639 and ISO 3166</p>
<p><relation> 0:M <kind> 0:1 {IsPartOf, HasPart, IsVersionOf, HasVersion, IsFormatOf, HasFormat, References, IsReferencedBy, IsBasedOn, IsBasisFor, Requires, IsRequiredBy}</p>
<p><annotation> 0:M <person> 0:1 <date> 0:1 <description> 0:1</p>

Element <educational> is particularly important for the DL system. This element is separated as the most important element, because the metadata about learning materials is stored here. Here are described: type of interaction, type of material, the level of interaction, the density of semantic content, the role of user content, age of the user, the difficulty of the offered learning materials, etc. Most of the values of these elements are pre-defined by the Standard. The choices of learning strategies to be applied in the future, are based on this element. In support of this there are most important items included in <educational> element like: <interactivitytype>, <interactivitylevel> and <semanticdensity>. Really, **the interactivity** is something that distinguishes e-learning materials from the classic printed material, if there is no interactivity, DL system is obsolete.

In addition, interaction between <semanticdensity>, <context>, <typicalagerange> and <difficulty> is unavoidable. The interaction of these elements directly determines the difficulty of the material from the standpoint of students. If this, relative difficulty is too big or too small, then DL system does not fulfill its intended purpose. Indeed, this relative difficulty of learning materials is something that matters when DL system is assessed by student. So, the difficulty proposed by system designer (**the absolute difficulty**) is transformed to **the relative difficulty**, that is, the difficulty from a student's standpoint.

Furthermore, **the adaptivity** of DL system directly depends of these elements. The adaptivity properties of DL system are achieved through correct choice of the values of this elements. This is a base for the implementation of the time-dependent adaptivity function. The difficulty of presented learning materials can be altered in a time dependant manner: over time, students are supplied with learning materials whose difficulty increases or decreases. The main intention of this is to influence the development of the student mental focus. The increase or decrease of learning materials difficulty is directly related to the student's progress and this is measurable variable, measurement is done through customized tests. Finally, overall adaptivity function can be achieved through time-dependent adaptation linked with adaptation related to student's progress.

The name and structure of mandatory and optional elements and the pre-defined values of individual elements prescribes the data type of each element. SCORM standard offers access to creating work environments (Run Time Environment-RTE) through LMS, which can be interpreted through the API. There is a possibility to change the selection of optional SCO elements at any time.

IV. CONCLUSION

The paper proposes a model of distance learning systems (DL) over the Internet, according to the

SCORM Version 1.2 (The Sharable Content Object Reference Model) standard. SCORM standard specification offers educational programs that have properties that are easily available; interoperable, durable, easily changeable. Table 1 describes the mandatory elements shared content objects (Sharable Content Object-SCO), and Table 2 contains formally optional but essential elements of SCO. The DL system can be achieved only by mandatory elements, but such one system will lack essential properties such as interactivity and adaptivity.

It is concluded that element <educational> is particularly important for the DL system. This element together with sub-elements: <interactivitytype>, <interactivitylevel> and <semanticdensity> has the direct impact to the interactivity of DL system.

Further, it is concluded that elements <semanticdensity>, <context>, <typicalagerange> and <difficulty> are in interaction that produces the relative difficulty of learning materials. This relative difficulty from student's standpoint is opposed to absolute difficulty from system designer's standpoint.

It is proposed that overall adaptivity function of the DL system can be achieved through time-dependent adaptation linked with adaptation related to student's progress.

Future work will include selection and involvement of additional SCO elements and implementation of SCORM based DL system.

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Development of Java Application for Project Management Support in Educational Information System

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Abstract –Business processes in educational institutions could be organized as projects. Especially educational process itself could be conducted as project - it starts each school year for particular educational groups in specific educational environment conditions. Success of project management depends on information system that enables support to all activities of project lifecycle. A process and results of creation of information system for project management support is presented in this paper. The information system is developed by using java technology as n-tier LAN and Web application.

applications are used as separate software tools. Usually they are not integrated with information system of an organization that actually collects/acquires data related to business processes. In this paper it is proposed that information system of an organization should have specific modules of software subsystem related to project management support. Java technology based software support to project management is developed to be used within "project-oriented" educational institution information system.

I. INTRODUCTION

"Even the simplest methodologies, if they are accepted from organization and applied correctly, could raise the possibility of success." [1] Application of project management methodologies in organizations is usually motivated by type of business. Certain organizations' basic business process is related to creation, conducting, implementation and evaluation of projects, so they are naturally directed to project management practice. Other organizations apply project management to their business, even it is not essentially project- related. Introducing project management to organizations, that are not essentially project-oriented, brings the term "project organization" for those organizations that apply project management to their business [2].

Educational institutions' basic business process is education, organized periodically within school years. Each school year there are certain educational conditions within education as a process is conducted. Project management approach to educational process brings clearly defined monitoring during educational process.

Monitoring of business process, especially if it is project management oriented, needs to be supported by an information system. "Without information system, that takes data about starting planned indicators about project realization and timely acquire data about the state of project during implementation, it is not possible to initiate needed management activities, which means that it is not possible to conduct permanent monitoring and control and manage project" [2].

There is commercially available software developed for project management support. These software

II. THEORETICAL BACKGROUND

Project management as a discipline have been developed to the standard frameworks (PMBOK [3], PRINCE2 [4]) applicable to any semantic/problem field.

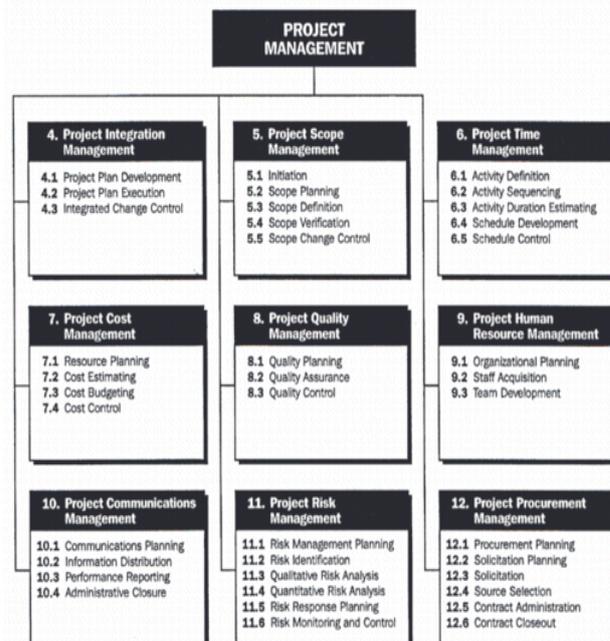


Figure 1. Knowledge and process areas of project management, according to PMBOK (3)

According to PMBOK, there are nine major knowledge areas and skills needed in professional environment.

These are: project integration management, scope, time, cost, quality, human resources, communication, risk and procurement [3]. PMBOK gives more flexible approach, while PRINCE2 methodology gives more precise directions.

III. RELATED WORK

Value and outcomes influences have been examined in research [5], while project management maturity (f organizations) research was conducted and presented in [6].

In research [5] it has been shown that tools are one of quality factors in integrated implementation view that influences the quality of outcome value.

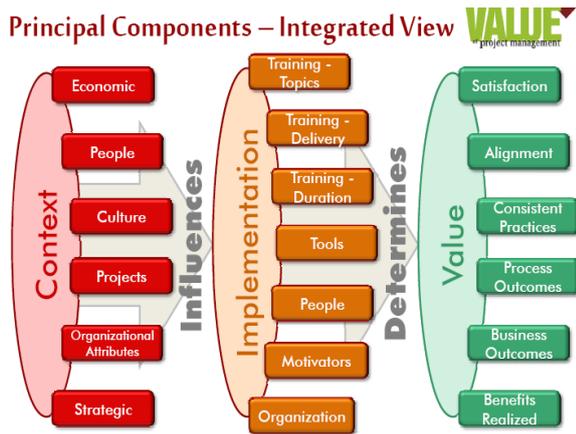


Figure 2. Context, Implementation, value of project management ([5])

In research [6] has been shown that most of organizations that were interviewed regarding quality considerations of project management application, shows that maturity level of these organizations is very low (Figure 3.)



Figure 3. Maturity level of project management application in organizations

IV. THE CONCEPT OF SOLUTION

A. Research problem and scope

The statement of research problem relates to integration of software tools for project management support with information system of an organization that would implement project-oriented organization and work.

Information system of an organization could be very complex ([7]). Within project [8] "Improvement of students' administration office information system" broader scope and rough specification of educational institution information system architecture has been defined. More precisely, information system support to educational process is specified (Figure 1). In this paper we present an extension (related to project management support) to the core of educational information system.

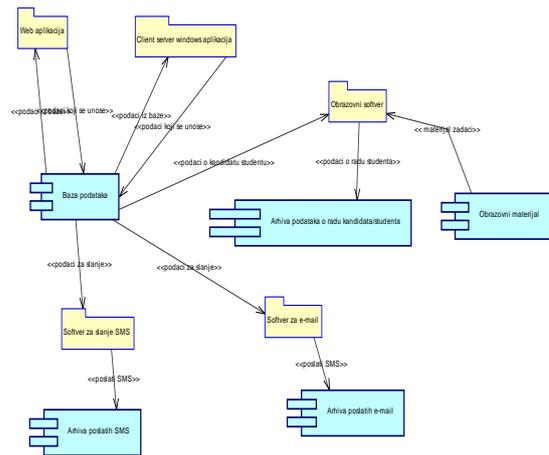


Figure 4. Educational process support of information system ([8])

Extended architecture includes modules that are integrated with other modules. This module is related to project management (Figure 5).

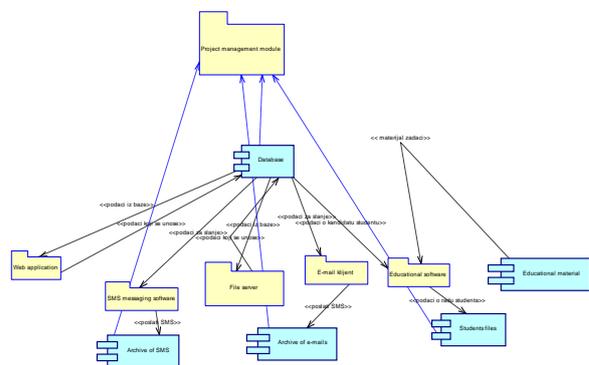


Figure 5. Proposed solution of integration

Additional module for project management support is integrated with the rest of architecture modules, especially with database (Figure 5).

V. ELEMENTS OF IMPLEMENTATION

Proposed solution is developed through the process of information system development, starting with modelling (using CASE tools) and finalizing in database creation (DBMS) and programming (development environment).

A. Business domain modelling

In first phase, modelling starts with problem domain logical entities specification (Figure 6).

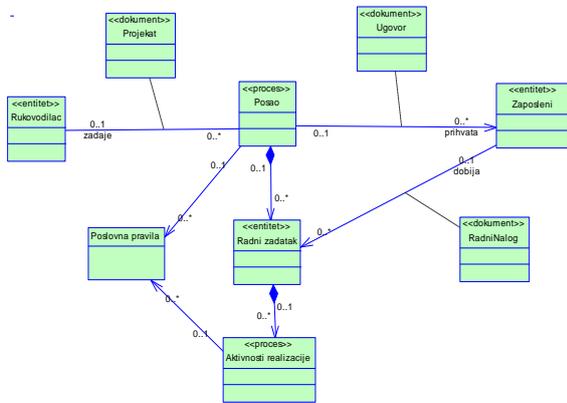


Figure 6. Entities of problem domain

Business process model presents flow of business activities and data needed to be transferred or stored (figure 7).

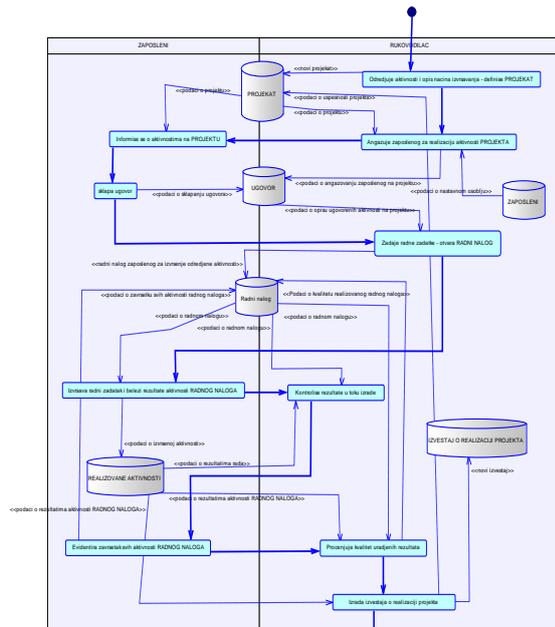


Figure 7. Business process model

B. Software design

Second phase is software design. By mapping business processes to software functions and use cases, use case models are created for each work role (figure 8 and 9).

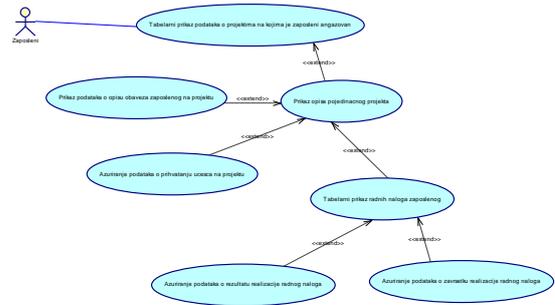


Figure 8. Use case diagram for an employee role

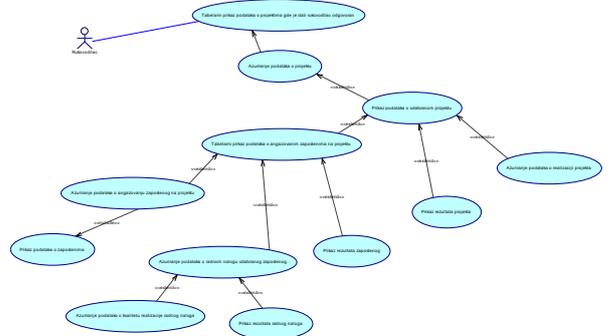


Figure 9. Use case diagram for a supervisor role

Conceptual (Figure 10), physical and object oriented model (Figure 11) lead to database creation as well as classes programming.

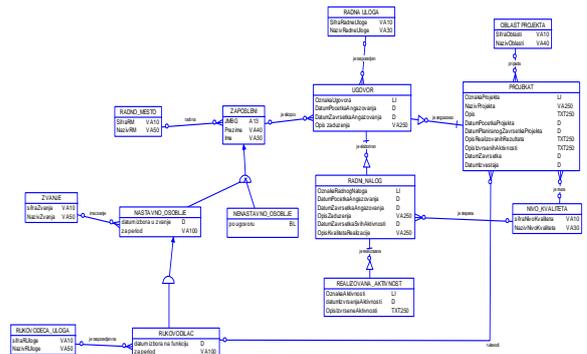


Figure 10. Conceptual data model

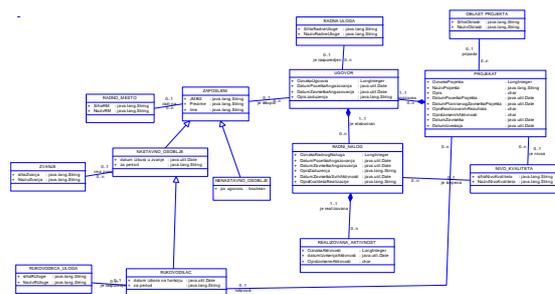


Figure 11. Object-oriented data model

VI. CONCLUSION

Today there are many commercially available tools as support to project management. What is really important is the source of data for these tools.

In this paper we propose integration of project management tools with information system of an organization. One of possible ways to implementation of such integration is creating separate module of an information system that could be support to project management.

In this paper we presented the process of specification, design and implementation of a software module that is to be used as support to project management. Particularly, this module is designed to be support in educational information system.

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Measuring Success of Green IT Projects: Balanced Scorecard Approach

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Abstract – Environmental protection efforts in the field of information technologies is called “green IT movement”. Green IT should be implemented at enterprises within projects, that are created according to strategic goals of an enterprise. Balanced scorecard is one of the most used methodology of measurement success of strategic goals achievement. This measurement is based on key performance indicators definition and data acquisition, i.e. monitoring. In this paper connection between Green IT efforts and achievements measurements based on balanced scorecard is presented.

I. INTRODUCTION

Environmental protection has been introduced many years ago at state and government level throughout policies and laws and regulations. These regulations state requirements of human behavior regarding environmental protection, as well it requires certain organizational process and technologies to adapt to the needs of environmental protection. Organization infrastructure, business processes and human behavior should be changed in aim to be dedicated to minimize environmental impact. Usually, ecology movement that is focused on environmental protection is simply called “going green”, or in organizations: “corporate social responsibility”, sustainability etc. [1]

Green IT [2] projects in enterprises are directed to establishment information technology and organizational practices to improve their environmental impact. These projects should be designed upon general strategic goals of an enterprise and supported by strategic management of an enterprise. Success of these projects is measured and monitored according to set of criteria formulated as key performance indicators and defined by strategic management of an enterprise. Balanced scorecard is one of the most popular [3] frameworks used as guide to definition of business process key performance indicators. Balanced scorecard framework enables defining key performance indicators to be related to measurement of quality criteria of business processes and the level of their strategic goals achievements.

In this paper, theoretical background and related work in the field of Green IT and Balanced scorecard in IT is presented. Contribution of this paper is in establishing connection between these two fields. Since green IT efforts are defined and conducted within projects, success of these projects could be measured and monitored during

these projects upon key performance indicators that could be designed according to well – established methodology of balanced scorecard.

II. THEORETICAL BACKGROUND

A. Performance measurement and Balanced Scorecard

“Performance measurement is evaluating how well organizations are managed and the value they deliver for customers and other stakeholders”. [4] The significance of performance measurement is described in well-known sentences: "if you can't measure it, you can neither manage it nor improve it" and "what gets measured, gets done" [5]. Performance measures must be [6]: meaningful, unambiguous and widely understood; owned and managed by the teams within the organization; based on a high level of data integrity; such that data collection is embedded within the normal procedures; able to drive improvement; linked to critical goals and key drivers of the organization. There are four key steps in a performance measurement framework [6]: the strategic objectives of the organization are converted into desired standards of performance, metrics are developed to compare the desired performance with the actual achieved standards, gaps are identified, improvement actions initiated.

"One of the best approaches to identifying the appropriate performance metrics (i.e. key performance indicators - KPI) is through the use of a methodology known as the Balanced Scorecard (BSC). The Balanced Scorecard approach provides executives with a comprehensive framework that translates a corporation's strategic objectives into a coherent set of performance measures. It provides a framework that not only provides performance measurements, but helps planners identify what should be done and measured. It enables executives to truly execute their strategies." [3] The balanced scorecard approach is “consistent with the concepts of cross-functional integration, customer supplier partnerships, continuous improvement and team accountability” [7]. Kaplan and Norton [5] expanded the existing view of performance metrics, which were then primarily financial, into four perspectives: (1) financial, (2) internal business, (3) customer, and (4) innovation and learning (i.e. learning and growth). " [8]

B. Green IT

“Green IT” is a short name for efforts in the field of information technology construction and usage in aim to minimize their impact to environment [2]. “We define sustainable IT services in broader terms to include the impact of IT service strategies on the firm’s and customers’ societal bottom line to include economic, environmental, and social responsibility criteria for defining organizational success.” [9]

Within broader scope of Green IT belongs the field of “green computing” related to using of IT equipment. Green computing is “the practice of maximizing the efficient use of computing resources to minimize environmental impact” [10]. “Green computing is the study and practice of using computing resources efficiently and that the main objective is to minimize the pollutions of environment.” [9]

Factors that influence environment and are related to IT are called Green IT impact factors. In research [11] the model presents relationship of four categories of green computing factors: *Hardware* (processors and other computer units, consumption of energy and producing heat), *Software* (n-tier layers software, software as service, efficiency of using hardware resources, speed of algorithms), *Working environment for hardware* (design of buildings, heat, ventilation and air conditioning (HVAC), computers rack) and *Behavior* (definition of metrics for green impact, people behavior directed by education and policies).

III. RELATED WORK

A. Green IT history and motivators

Green computing history is divided in two phases [9]. First phase is called “green computing” and is related to: factors driving the adoption of green computing (rapid growth of Internet, increasing equipment power density, increasing cooling requirements, increasing energy costs, restrictions on energy supply and access, low server utilization rates, growing awareness of IT’s impact on environment), implementing green computing strategies: data center infrastructure, power and workload management, thermal load management, product design, virtualization, cloud computing and cloud services) and development of green computing metrics (energy efficiency, environmental impact). Second phase is called “sustainable IT services” and is related to: moving from software programs to software as service, developing sustainable IT services according to criteria (service sustainability, temporal sustainability, cost sustainability, organizational sustainability and environmental sustainability), moving goals from business value to customer value to societal value, developing sustainable IT strategy and introducing environmental regulations.

In recent years, there are several studies conducted with IT professionals and IT companies related to green IT and green computing motivators and sources of green direction forces. Green IT application main motivators for IT professionals study [12] shows that most frequent reason for introducing green IT are regulations and cost savings, while PR image, customers requirements,

genuine concern and shareholder pressure is less frequent. Another survey is conducted with European large IT companies directors [1] and it shows that great majority of number of IT companies that have already green IT strategy for IT infrastructure are from Germany and UK, less from Nordics and France, while the least are from Italy, Spain and Netherlands. Green IT initiative driving forces for these IT companies are mostly: cost reduction/savings, regulatory compliance, reaching sustainable level of energy consumption, while recycling and corporate social responsibility are less present. Finally, the least present are chief executives forcing, transparency to company carbon footprint, brand image, customer expectation, employers choice and employees initiatives.

B. Green IT initiatives and projects

Green IT initiatives present activities that are moving forward in implementing environmental protection goals in the field of IT production and implementation. These activities could be categorized according to previously presented four categories of impact factors [11].

In the field of *behavior* category, there are several types of activities. At international level, corporate sustainability index is defined as a standard metrics system for measuring application of environmental initiatives in organizations [13]. Company level is related to introducing policies and procedures for implementation of green IT, established internal recycling programmes, conducting energy audits in the workplace [14], encouraging remote working and teleconferencing as a travel replacement [1]. Education level is related to introducing Green IT in schools [15] as seminars, Green IT graduate diplomas and professional certificates for IT professionals [2], research on educational impact [16] and role of green IT in computer science curriculum [17]. Personal level include activities such as using fewer IT resources such as printing paper and read only DVD/CD, power off computer when not using it, dimming the PC brightness etc. [10].

Hardware and working environment for hardware include green IT initiatives and activities such as: investing in technology such as hardware and software virtualization to increase datacenter efficiency [1], more efficient processors, flat monitors, smaller hard disks use less energy [18], consolidation of storage [16], devices are designed to have idle/sleep mode [12], remote shut down of computers [16]; networks - centralization of printer devices, database and processors with thin clients, mobile devices - mobile phones, PDA, laptops - less time of charging, recycling; reusing heat from air-conditioners, while travelling / using satellite/communications devices and software for navigation and shortest travelling routes, using sensors that could remotely measure and control devices, substitution of physical process to digital [12].

Some of green IT initiatives in *software* aspect include: scheduling algorithms [11], creating autonomous software controllers of quality of service and energy management [19], having software monitor state of usage of hardware devices and optimize its usage [12], defining

metrics for distributed software project management environmental impact [20].

C. *Balanced scorecard in IT projects*

Balanced scorecard as framework for definition of key performance indicators has evolved to many particular solutions of balanced scorecard, when applied in specific semantic conditions. The need for integration of different particular solutions of key performance indicators appears in complex organizations, such as ICT departments of large enterprises or organizations in public sector [21].

Recent history of balanced scorecard research and applications in the field of information technology shows that balanced scorecard framework was included in:

1) IT projects management: Alleman [22] discusses that balanced scorecard and project management should be unified (especially for IT project focused organizations) in aim to link strategy and implementation; Brock [23] proposes model of balanced approach to IT project management; Asosheh (Asosheh et al 2010) propose integration of balanced scorecard and data envelopment analysis (DEA) for information technology project evaluation in the process of selecting among project proposals. Control Objectives for Information and related Technology (CobiT) framework [25] includes linking business goals to IT goals, providing metrics (based on BSC) and maturity models to measure their achievement and ensure that the enterprise’s IT supports the business objectives.

2) Software projects management: Specific methodologies, such as agile approach resulted in agile balanced scorecard [26], which emphasizes teamwork, velocity, reliability and performance as key metrics categories. Software Engineering Institute describes the synergistic application of the balanced scorecard and goal-driven measurement methodologies (goal - question - (indicator) -measurement) to develop measures and associated indicators ([27]). Balanced scorecard is adapted to particular needs of software project monitoring [28] and more precisely, to the needs of students teamworks [29].

IV. BALANCED SCORECARD IN GREEN IT PROJECTS

Balanced scorecard is a framework that offers guidance to construction of set of key performance indicators needed for evaluation of a process and results. Application of balanced scorecard in particular semantics areas lead to creating particular and specific set of key performance indicators that could reflect goals to be achieved. In this paper, the basic aim is to show how balanced scorecard methodology could be applied in Green IT projects. In research [15] several projects related to application of Green IT in schools are defined. Basic goals are defined as “cleaning IT” and “cleaning business by using IT”.

A. *Approaches in Green IT implementation*

There are several approaches in Green IT activities organization. One of them is called “cleaning IT”, which means that existing information technology should be used with less power and material resources, improving technical performances of existing hardware equipment. Others are directed towards better construction of equipment. Third is focused on “cleaning business by using IT”, which means that information technologies are used to improve business processes effectiveness, and therefore improve their impact to environment

B. *Green IT projects in educational institution*

Educational institutions are non-profit organizations and goals of “going green” are much different comparing to business organizations. In research [15] a model of green IT initiatives is proposed for implementing in different organizations generally (Figure 1), and particularly in schools within set of projects (Table 1).

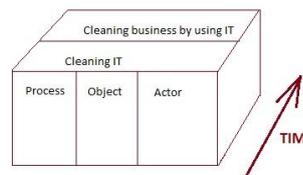


Figure 1. A model of green IT application in organizations [15]

Table 1. “Process aspect” of Green IT application in schools

TARGET	Cleaning IT	Cleaning business by using IT
Basic business process: education	Paperless communication	Using educational software for educational process improvement
Supporting processes: infrastructure, equipment and materials supply and maintenance, administrative work, human resources work	Supply and maintain infrastructure, equipment and materials that are green IT certified	Using Internet for communication with suppliers (email) and parents (web site of school), creating software for administrative work support (increasing paperless communication)
Management processes related to: basic business process and related to supporting processes.	Paperless communication with other staff	Creating management support software, such as data warehouse and business intelligence systems Encouraging green IT behavior by special grants to teaching and administrative staff Encouraging pupils/students for green IT behavior by competitions and grants

Table 2. “Objects aspect” of Green IT application in schools

TARGET	Cleaning IT	Cleaning business by using IT
Teaching materials and documents	Paperless communication and teaching material	Educational content at school website, on-line learning by e-learning systems at school web site
Infrastructure (including working environment for hardware) Equipment (including: Hardware, Software) Materials	Buying green IT certified equipment to enable teaching staff and administrative staff to use computers in their work	Creating efficient software for administrative work, in aim to support minimize power consumption
Regulations, laws, procedures	Procedures for using IT equipment in green IT manner	Establishing support for e-learning accreditation

Table 3. Actors aspects of Green IT application in schools

TARGET	Cleaning IT	Cleaning business by using IT
Teaching staff Pupils/Students Parents	Education to use existing IT equipment in green IT manner	Education in IT application
Administrative staff		
Management staff		

C. *Balanced scorecard key performance indicators in green IT projects*

Key performance indicators should be defined according to goals that need to be reached during and after each project is finished.

Green IT is related to reaching goals in “cleaning IT” and “cleaning business by using IT”. How can we measure the level of reaching these goals? Balanced scorecard framework could help in defining metrics.

Table 4. shows three-dimensional model (a cube) that presents a general model for creating key performance indicators related to green IT projects.

Table 4. Three-dimensional model for application BSC in green IT projects

Hardware		
Software		
Working envir.		
Human behaviour		
Balanced scorecard categories	Goal: Cleaning IT	Goal: Cleaning business by using IT
Finance		
Internal process		
Customer		
Learning and growth		

Examples of key performance indicators according to proposed model could be:

Balanced scorecard categories	Goal: Cleaning IT
Finance	<ul style="list-style-type: none"> ➤ Amount of money spent on buying new ecology friendly: Hardware, Software, Working env., Human beh. ➤ Cost savings because of using eco-friendly products
Internal process	<ul style="list-style-type: none"> ➤ Number of working hours with / without eco-friendly i.e.fast and reliable equipment
Customer	<ul style="list-style-type: none"> ➤ Number of satisfied customers (students, teaching staff) with new equipment and working procedures (comparing to previous technologies)
Learning and growth	<ul style="list-style-type: none"> ➤ Number of hours in education related to green IT

V. CONCLUSION

Green IT projects lead an enterprise to establishment of new equipment and organizational behaviour that enables environment protection and sustainability of working conditions. Green IT projects are defined within broader scope of strategic management decisions of goals to be achieved in an enterprise development.

The fact that green IT projects are initiated and conducted by strategic management leads to the natural connection between these two fields. Effects of implementation of any project sometimes are not exactly visible during and after the project finishes. Therefore, it is needed to establish a evaluation system that would be

based on measurements, i.e. key performance indicators, that could be used for monitoring the success of the project.

In this paper is presented how balanced scorecard framework could be used to help creating evaluation model for monitoring of green IT projects. For each of evaluation criteria there could be set of indicators whose values could easily be registered and evaluated. This way we show that it is possible to create an evaluation model for green IT projects monitoring, based on balanced scorecard as general framework.

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Optimizing Images for Search Engines

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Abstract - In this work the optimization of pictures for using at the Internet has been described. Important parameters such as the name of picture, alternate image text, archiving of pictures, text for link, picture format, size of picture are analyzed. The part of this work is dedicated to the search engine optimization for mobiles phones. At the example of the web site www.smileclinic.rs are shown parameters for search engine optimization.

I. INTRODUCTION

Optimization of the Web Site (Search Engine Optimization - known as SEO) for the search engine (Google, Yahoo, MSN, etc.) is a set of activities which can be executed at the web page (page optimization) and/or out of the web page (off page optimization), with the aim of better position of the web site at the search engines [1]. The process of optimization can take from few days to the few months, depending on the optimization level. Next part of this work will describe some of the ways of optimization picture in the process of SEO for the web site.

Since many graphics formats developed, which allow the appropriate application of data compression in order to reduce file size, the first chapter is devoted to the properties of images and mathematical methods for image compression, reduction of color and Image Compression Standards.

The second chapter deals with the processing of images in the Adobe Photoshop software, while the third chapter is devoted to formatting images using Hypertext Markup Language (HTML).

The fourth chapter deals with the ways of using, processing and compressing the images using the Cascading Style Sheets (CSS).

The fifth chapter deals with the optimization of images using the PHP programming language. Besides the optimization of already existing files, this section deals with creating your own graphics, converting the text to the picture, creating the charts in real time.

The sixth chapter is devoted to the Search Engine Optimization (SEO) and how to Optimize Images for Better Search Engine Rankings. It also shows the optimization of images for use on mobile phones.

II. IMAGE ANALYSIS PARAMETERS

At the base of the mentioned parameters in the following example will be displayed image compression for determined image, uploading images via CSS, the use of meta-tags on the site.

As shown by the example, the processed image which contains a lot of colors and represents the picture of the real world. As such it's ideal for storing in JPEG format. On the basis of the presented experience, all the other images used for the FLASH banner on the Web site have been processed. The first image (Figure 1), in the series of four pictures presented, has been exported in GIF format and has a weight of 9,949 K, but it is of very poor quality (we can see the pixels) and because of that the same image has been compressed in GIF format with 256 colors. The resulting image quality is of better quality, although we can notice the shades of blue crosses in the background of the picture that should not be seen. It is nearly four times heavier than the photo that has been compressed in JPEG format with the Quality of 60 (Figure 3)

The images with compression used for creating flash banners can be viewed in the Fig.1 to Fig. 4.



Figure 1. GIF 8 color (9,949K/4 sec)



Figure 2. GIF 256 color (32,07 K/12 sec)



Figure 3. JPEG quality 60 (18,3K/7 sec)



Figure 4. JPEG quality 100 (41,5K/16 sec)

CSS (Cascading Style Sheets) is a language format by which the element defines a Web site. Several advantages has been cited on the use of CSS in web design. Some of those advantages are as follows: Faster loading of pages, Efficient and easy, Consistency, SEO friendly, Accessibility, Maintainability, Usability, Sophisticated layouts and designs, Bandwidth efficient. [2] [3]

Next example will show how we will load background for menu button with Cascading Style Sheets.

```
mainmanpicture{
    background-image: url('/images/m111.jpg');
    width: 110px ;
    height: 29px;
    background-position: right top;
    background-repeat: no repeat;
    align: center;
    padding-bottom:0px;
}
```

In the second example is shown way for the setting the background for the buttons in the menu, setting position loaded images, adjust parameters for the text:

```
. picture2 {
    background-image:url('/images/gm2.jpg');
    padding-bottom:0px;
    background-position: right top;
    background-repeat: no repeat;
    align:center;
    width:68px;
    height: 21px;
    font-size: 10pt;
```

```
vertical-align: middle;
font-style: normal;
font-family: Calibri, Arial, Helvetica, sans-serif;
text-align: center;
}
.picture2 A:link {
    color: #000000; text-decoration: none
}
.picture2 A:visited {
    color: #000000; text-decoration: none
}
.picture2 A:active {
    color: #000000; text-decoration: none
}
.picture2 A:hover {
    color: #ffffff; text-decoration: underline
}
```

The Meta keyword tag is in using for On-Site SEO and can be used to list the main keywords for each page. Meta Description Tag is shown immediately under the title. These parameters we are putting in <head></head> section of our HTML. This should be limited to 156 characters (including spaces).

```
<head>
<META
NAME="KEYWORDS"CONTENT=""smile,
stomatološka ordinacija, smile clinic - stomatološka
ordinacija, Nikola Bogdanovic, Nikola, Bogdanovic,
zubar, Beograd, Srbija, smile clinic Beogard">
<meta name="description" content="Strucnost,
iskusan tim, 20 godina postojanja, preko 2000 pacijenata,
najnovije metode u radu garantuju uspeh.">
<meta name="robots" content="all">
</head>
```

A. Name of picture

After finding the right kind of image, which is incredibly important for selling the page, the next important thing is to give your images detailed, informative filenames. A title tag tells both users and search engines what the topic of a particular page is. If we have at the web page picture with the name "image1.jpg", it's saying nothing about picture to the search engines. Because of that we should give some name which will describe it and at the end give useful information about the picture and the web page to the search engine.

B. Alternative image text

Alternative image text (Alt tag) enables to the search engines to categorize the picture. Alt tag is used to describe graphics by displaying a block of text when you do mouse-over. Search engines are unable to view graphics, distinguish text or other surrounding text that might be contained within them, because of that they are using alternate image text and the name of the graphics. [4]

Next code show short but correct text for alt tag:

```

```

If by any chance the image can't be displayed, the contents of the alt tag will give information about the image. In the case of using the image as a link, alternative text for that picture will be showed in the case of the absence of picture. However, it is not advisable to use too many images as the navigation of the web page because text links have the same purpose. Finally, if you optimize your image filenames and alt text, it makes it easier to image search programs such as Google Image Search to better understand the images stored on the site.

C. Archiving of images

It's good to archive images in their own directory. Instead of having image files spread out in numerous directories and subdirectories in the whole domain, it is good to consider the option of matching files in a directory in the entire domain. This method of archiving files simplifies searching files and edit them later [5] [6].

D. Text for link

Often blue and underlined, hyperlinks, commonly called "links" for short, allow you to navigate to other pages on the Web with a simple click of your mouse. Link or anchor text is an important element of search engine optimization. It is important in the positioning of images in Google's image search (<http://www.google.com/imghp>). If you are linking to images, it's recommended to use a link text that describes the image content. This usually means that the text for link contains one or more keywords that are used in the image file name and the text alternative [4] [6]

E. Size of picture

People pay more attention to a clear image where they can see details, because of that it is good to use bigger pictures.

Some SEO experts believe that Google Image Search prefers the bigger picture. Although there is no evidence for it but logic tells us that this makes sense. The point of optimization for search engines is that users click on your link. If someone searches for a picture, there is a better chance to click on the larger picture of better quality, then click on the small picture of poor quality. This means that it makes sense to use a larger image on the website, of course, where appropriate. The second problem is using large pictures, because of their size. The size of images with compression can be reduced. This is the process of minimizing the size in bytes of a graphics file without degrading the quality of the image to an unacceptable level. Compression is done during recording images, and it is based on defined parameters, while the decompression is done automatically when you load images to display.

Considering the great need for image compression, the compression methods have extensively developed for the last twenty years and the research in this area is very intense nowadays. There are a lot of methods which can compress the still images up to 50 times without significant impact on the quality of the reproduced image.

In the case of the sequence of images, compression ratio can be much higher. The compression algorithms can be classified into two groups:

1. The loss of data compression (lossy) and
2. Compression without loss of information (lossless)

Lossy methods of compression are based on models of human perception. This method compressed those attributes of pictures which less contributes to the overall appearance of image. In this way, every step of the image compression /decompression will affect the quality of pictures, which causes image degradation. [1]

Lossless methods of compression ensure identical decompressed and the original image. This is very important for some areas like medicine, where it is necessary to provide high resolution and picture archiving unchanged. [1]

F. Format of picture

Images that use the website or blog should be in PNG, JPEG, GIF or BMP format, as they are common and most-used formats. Images in PNG are the best choice.

G. Context

The context is very important for SEO. The image should match the content of the web page. Content that surrounds the image should be in relation to the alternative text for images, text for link, image file name, and so on. Search engines will easier evaluate more easily whether the picture quality is good and whether the picture is relevant if all these elements match [7].

H. Without too many words

This rule still applies to the SEO. As in the case of talking about the content of the Web page, the image should be optimized for users, not for search engines, as well. Link text and alternative text, descriptions and image names should be short and descriptive, rather than a long list of keywords. You should always keep in mind the importance of experience and the user experience, not just positions on search engines.

III. OPTIMIZATION OF PICTURES FOR USING ON THE MOBILE DEVICES

Mobile SEO is probably the most underestimated area of the SEO. According to the research by Google, 77% of Smartphone users visit its search engine, and 90% of Smartphone searches results of action (purchasing, visiting a web sites, etc.) [6]. That's a pretty assuring fact to decide on optimizing the image of our web site for mobile devices.

In this sense, when you create a web site for mobile devices, it is necessary to set the focus of the story as brief texts and images customized screens of mobile devices, which can be achieved by decreasing the image resolution. This is very important because a lot of mobile users use slower mobile Internet surfing. Navigation hierarchy should be clean and simple with no unnecessary "rollover" option, and no pictures.

Successful mobile SEO requires a different plan than regular search engine optimization. For a site to rank well in mobile SEO, it will need a different set of keywords, different graphics and technical design and a different strategy than your regular website. [8]

Because mobile SEO relies more on quick information than pictures and graphics, sites designed for mobile SEO should not use Flash or Java. Search engines send out "spiders" to read information on websites and decide how to rank them. The spiders cannot read Java or Flash and thus anything in those formats will not help increase your ranking. As a general rule of thumb, mobile sites should have few pictures and no chunks of lengthy text.

For the best results, your website designer should develop a mobile version of your desktop website. While some businesses do have success with optimizing their desktop site for mobile search, this is not ideal or recommended. [8]

IV. CONCLUSION

Considering the high competition in the market among web sites, it is important that web sites load fast and display their content to the visitor. When meeting these conditions, it is important to pay attention to the fact that nowadays, even though we live in the age of high-speed Internet connection, there is still a certain group of users with limited access to the Internet at high speeds (especially in Serbia), and yet you do not want to exclude from a group of potential visitors of the presentation.

In fulfilling this goal, it is necessary to avoid (or at least keep to a minimum - a measure that will not harm the preliminary design) the use of multiple elements that prolong the loading time, but also to reduce and adjust the size of the output image with the minimum loss of quality of the latter. Today's standards of web pages require a well-chosen type of graphics file compression in order to achieve the best ratio "weight" files and display the same quality, as they are the two things in close interdependence.

By selecting the appropriate format for image compression, it's proper use, and the use of optimization, the optimization site will not only reduce the time required to load a web page, but also allows the presentation to be ranked high on the list of search engines and thus increasing the pool of potential visitors of the site .

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A Case Study from Iskratel: Improving the User Experience in a Telecommunication Company

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Abstract - This paper presents a case study from an international telecommunication company, named Iskratel. As the competition on the world market was rising, the company started to look for solutions how to be more successful than other competitive companies. Since it was impossible to lower the prices, the company decided that user experience could be the factor that brings Iskratel's products competitive advantage over other products on the market. The activities done in Iskratel in the past three years in order to improve the overall user experience of company's product and services are presented in this paper.

I. INTRODUCTION

The business success of a company is, apart from the complexity of its technology, also measured by how well the products and services of the company serve their customers. The world nowadays is highly competitive with wide choice of technically reliable products, services and solutions with numerous functionalities. In such world, products and services with great user experience represent a competitive advantage over other products in the market.

In this paper, we present a case study from an international telecommunication company, named Iskratel. Iskratel is a Slovenian company, with more than 50 years of experience in the world of telecommunications. The company develops telecommunications solutions for rural and suburban areas and designs comprehensive solutions for the communication needs of the information society [1]. In the past, when the competition was not a problem, the company was mainly concerned with the improvement of its technology. As the competition on the market was rising, the company started to look for solutions how to be more successful than other competitive companies. It was soon found out that the price could not be the factor that brings a competitive advantage to the company. Instead of that, the company decided to make the user experience the factor that makes its products better to its customers than other competitive products on the market.

Until fairly recently, the user experience of products and services in the company was evaluated only in development phases, i.e., in the phases of designing and implementing products. The users were not involved in the assessment of product quality from the standpoint of usability and user experience and in building these

findings into requirements for new versions of an existing or a new product [2]. That is why user's opinions, needs, wants, expectation and practices were not satisfactorily integrated into the product requirements.

In Iskratel the improvement of processes is a continual task. Based on analyses of the product's weaknesses, improvements were needed to increase the users' satisfaction. The company recognized that close cooperation with users may contribute to a better user satisfaction and user experience. That is why Iskratel started a close cooperation with its users from the specification of the product requirements to the testing of the new technology in users' premises and the assurance of high-quality support [3]. The activities done in Iskratel in the past three years in order to improve the overall user experience of company's product and services are presented in this paper.

II. USER EXPERIENCE

A. Definition

Before we continue with the presentation of the activities, we would like to clarify what the term user experience is.

According to ISO 9241-210 user experience is defined as "a person's perceptions and responses that result from the use or anticipated use of a product, system or service" [4]. User experience includes all the users' emotions, beliefs, preferences, perceptions, physical and psychological responses, behaviors and accomplishments that occur before, during and after use.

Product with optimal user experience is primarily usable; however it provides much more than pure usability. If usability is understood as a form of rationality (ex. effective to achieve a particular goal), the user experience is happening at the level of emotions. Parts of the user experience are, for example, professional design, which is confidence-inspiring; and clear and concise text that provokes irrepresible desire to use.

Product with optimal user experience invites and engages the user, leaving a positive memory. As a result the user returns to the product and is happy to use the product again and again.

B. User Experience Guidelines

Preparing user experience guidelines is usually the first (unfortunately, in many cases also the only) step towards the process of improving the overall user experience in a company. So, when Iskratel decided to improve the user experience of its products, the first task assigned to the user experience team was to prepare a user experience guidelines document. A set of best-case experiences, user experience guidelines and information were collected in a document, which is constantly being updated. An example of a best-case and worst-case scenario from the document is shown in **Figure 1**. The aim of the document is to ensure that user experience design is even more closely integrated in the future products development process [5].

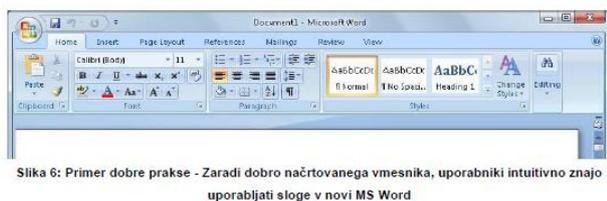
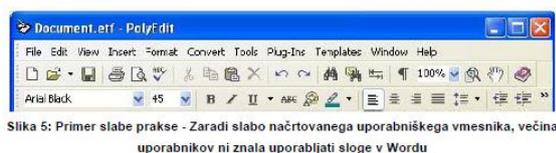


Figure 1. Examples of a best-case and worst-case scenario in the user experience guidelines document

However, using only a user guidelines document in the company is not enough for achieving great user experience. Instead of that, users have to be involved continuously throughout the development process – from the product conceptualization phases till the very end i.e. testing the new products and technology with users. The approach where extensive attention is given to the users is known as user-centered design (UCD) [6].

III. USER-CENTRED DESIGN

A. Definitions

The term user-centred design/development (UCD) has its origins in the mid 80's [6]. UCD represents a design philosophy and a process in which the needs, wants, and limitations of an end user of a product or application are given extensive attention at each stage of the design and development process. UCD is the key to designing for good user experiences. Users' needs and values must be understood first, before designing and evaluating products and solutions [7]. Understanding who the users are and what they need is the single most critical activity to developing a quality product and/or solution. Understanding the users usually begins by developing a user profile [8].

B. User Profiles

User profiles are detailed descriptions of user attributes, such as: age, gender, level of education, occupation, experience, key tasks, etc. These characteristics usually reflect a range, where the target users fall within, for example, ages 25-50. User profiles help the project team understand who they are developing the product for, and help the user researchers when recruiting users for further study activities.

There are several user characteristics that should be considered when developing a thorough user profile. In their book, Courage and Baxter provided an ideal list of user characteristics that should be taken into account when creating a user profile [8]. However, researchers usually don't have access to all of the information to create an ideal list of user characteristics. Additionally, some of the user characteristics are more important than others according to the product, the context of use and the situation. That is why, user characteristics should be prioritized and only key characteristics should be considered. For example, for Iskratel users, the key user characteristics considered are:

- Demographic characteristics – age and gender.
- Education - degree, courses taken.
- Occupation experience – current job position, and responsibilities, previous jobs and responsibilities, years of experience.
- Computer experience - computer skills, years of experience.
- Specific product experience – experience with competitors' products or other domain-specific products, usage trends.
- Domain knowledge-the users' understanding of the product area.
- Task – primary, secondary tasks.
- Technology available-computer hardware, software, other tools typically used.
- Attitudes and values – product preferences, fear of technology.
- Criticality of errors-in general, the possible consequences of a user's error.

The key user characteristics were used for creating a user profile for the typical Iskratel user as shown in **TABLE I**.

C. Personas

User profiles provide data for developing *personas*. A persona is a fictional individual created to describe a real end-user. Personas are designed to give real users live and help team members feel connected to them. One of the most important advantages of personas is they help all team members to think about the same persona, instead of each team member working towards his or her own vision of who the end-user is.

TABLE 1. User characteristics for typical Iskratel users

KEY USER CHARACTERISTICS		
Demographic characteristics	Age	25- 55
	Gender	80 % male 20% female
Education	Degree	High school to bachelors degree (usually college)
	Courses taken	Computer science, telecommunications, electronics, electrical engineering
Occupation	Job position	Telecom operators
	Responsibilities	Monitor or/and operate equipments related to telecommunication sector
Computer experience	Skills	Basic computer skills
	Experience	Expert users
Tasks	Primary tasks	Responding or transferring calls as per the requirement. Answering service related questions of common types. Sending messages to people or notification lists regarding extraordinary events and alarms. If any complaint is received regarding the functioning of the systems maintenance technicians are informed by the telecommunications operator. Taking a note of the identification numbers of callers for future reference.
	Secondary tasks	Setting up conference calls along with monitoring where the information system is located. Managing all the related documents in such a way that accurate records and data are always available as per the requirement. Managing all the related documents in such a way that accurate records and data are always available as per the requirement.
Technology	Hardware	Desktop computer, operator terminal, stationary or mobile phone.
	Software	Applications specifically developed for telecom systems.
Attitudes and values	Product preferences	Easy to handle and operate with.
Criticality of errors	Consequences	From mild to severe consequences.

In Iskratel, three personas were developed for each user profile. All together, there were eighteen personas developed for company’s target users. Developing multiple personas for a single user profile helps covering the range of characteristics for the selected user profile.

One of the personas we have developed for the user profile presented above is shown in Figure 2.

D. Use-Case Scenarios

Use case scenarios provide examples of usage and specify how users carry out their tasks in a specified context. Such scenarios can be used as an input to design, and provide a basis for subsequent usability testing.

Use case scenarios are most useful when created early in the product development cycle as specific, realistic and detailed examples of what a target user would do, but without making any reference what user interface features that would be used.

An example for a use case scenario is shown in **Figure 3**.

Name: Janez Novak
Age: 32
Family: Married, with two children.
Location: With his family, Janez lives in a small flat in the center of a city.
Education: Telecommunications college
Hobbies: Janez plays basketball with his colleagues once a week. He loves to watch science-fiction movies in the cinema. He spends the holidays with his family camping near the sea.
Job: Janez likes being an operator most of the time. He is very talkative and kind to the customers. However, sometimes Janez is bored at work, as he believes he is able to do more.



Figure 2. Persona for a typical Iskratel user.

A few minutes before the end of the workday, Janez receives a call from a customer. The customer complains she wasn't able to call her sister. Janez uses the application for network management and finds a red alarm. He immediately informs the technical service about the problem. Janez thanks the customer for her call and ensures her the problem will be solved in a convenient time.

Figure 3. Use case scenario for Iskratel

IV. USER EVALUATIONS

User evaluations are really important for improving the overall user experience in a company. User evaluations are used for assessing five product aspects: efficiency, affection, helpfulness, control and learnability. User evaluations take place in different phases of the product development. For example, in the early stages of the product development user evaluations are used to predict the usability and usefulness of the future products, to verify whether the developers understand user requirements and for a quick and informal testing of ideas. User evaluations at a later stage of the product development focus on the identification of difficulties users have when using the product and on product improvements. Even though user evaluations take place throughout the product development life cycle, it is important to have as much of them in the early stages, as

correcting errors in the early stages costs less than correcting errors in the later stages.

When conducting user evaluation it is necessary to select proper user evaluation methods for evaluating the product a given environment, to determine the appropriate number of expert evaluators and end-user participants, and to determine the types of activities that users will accomplish using the product.

There are many different methods for testing the usability and the user experience of a product. Which method should be used depends on several criteria, such as [9]:

- The aim and objectives of the evaluation
- The availability of human resources (expert evaluators, end users, developers)
- The profile of the evaluation participants (end-users and / or expert evaluators)
- The number of participants in the evaluation
- The location where the evaluation takes place (user's environment or a laboratory)
- The technical equipment required
- The level of development of the evaluated product
- Expected level of product reliability and
- Expected level of detail of the evaluation results.

For a successful user evaluation of a product, it is not necessary to use only one method. Different methods perform differently in different situations in assessing and finding different difficulties. Therefore, it is reasonable to use multiple methods to improve the overall usability and user experience of a certain product.

To evaluate the overall usability and user experience of the company's products, services and solutions, Iskratel usually uses the following methods:

- Heuristic evaluation, which is informal and relatively inexpensive evaluation method. In this method, expert evaluators decide whether the elements of the user interface are in accordance with certain principles of user interface design [10].
- System Usability Scale (SUS), which is a simple, flexible, and affordable questionnaire. SUS can be used to assess a wide range of products and services. SUS is a simple, ten-item attitude Likert scale giving a global view of subjective assessments of usability [11].
- Task analysis, which analyses what a user is required to do in terms of actions and/or cognitive processes to achieve a task. A detailed task analysis is conducted to understand the current system and the information flows within it [12].

- AttrakDiff, which evaluates and compares the hedonic and pragmatic quality of interactive products. The evaluation data enables us to gauge how the attractiveness of the product is experienced, in terms of usability and appearance and whether optimization is necessary [13].

V. CONCLUSION

This paper presents several activities done in Iskratel in the past three years in order to improve the overall user experience of company's product and services. Iskratel is an international telecommunication company, which decided that user experience could be the factor that brings Iskratel's products competitive advantage over other products on the market.

Preparing user experience guidelines document was the first step towards the process of improving the overall user experience in Iskratel. However, since using only a user guidelines document was not enough for achieving great user experience, Iskratel introduced the UCD approach in its product development processes. In order to understand its users, the company developed user profiles for its typical users. User profiles provided data for developing *personas*, which are fictional individuals created to describe real end-users. To understand the context of use of its products and services, Iskratel created several use case scenarios, which provide examples of usage and specify how users carry out their tasks in a specified context. At the end, the company suggested several user evaluation methods to assess and improve the usability and user experience of its products and services.

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The Application of the Graph Theory in Cryptography

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Abstract – The paper deals with an alternative approach of the security system design, which is based on the data storage or transmission of a large amount of similar data. The symmetric cryptosystem is considered as a basis for implementing the algorithms that use the concepts from graph theory. A basic assumption is that the data (information, message) can be distributed in vertexes, edges and weights in a complete undirected weighted graph. The aim is to store or transmit the graph with contained data safely; therefore, the graph with contained data will be hidden into a collection of weighted graphs with the same supporting unweighted graph. Encryption and decryption algorithms based on this idea are presented and explained by pseudo-code.

I. INTRODUCTION

As the internet provides the essential communication channel between millions of people, security of transmitted data becomes the essential issue. It is

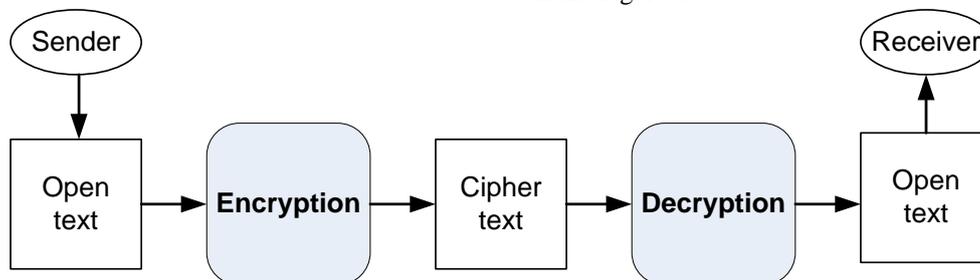


Figure 1. Cryptosystem

The sender sends some message to the receiver. As for the sender and for receiver, the message is completely understandable. If the data is understandable to those who read them, then such information is referred to as analogous to the open text, clear text or plain text. The encryption algorithm produces the cipher text that needs to be transferred through an insecure channel. The encryption algorithm is executed on sender's side while decryption algorithm is executed on receiver's side of the channel. After decryption algorithm is executed, cipher text gets converted to the open text on the receiver's side of the communication channel.

There are three types of cryptographic schemes regarding the usage of the cryptographic key: secret key cryptography (or symmetric cryptography, which uses a

certainly very important for the sender of the message, as well as for the receiver of the message, that message is protected from a third malicious unauthorized person, who listens to the communication channel. In the context of secure communication, there are some specific security requirements [1, 2], including:

- Authentication: The process of proving one's identity.
- Privacy/confidentiality: Ensuring that no one can read the message except the intended receiver.
- Integrity: Assuring that received message has not been altered, in other words the message was not changed during transmission process.
- Non-repudiation: A mechanism to prove that the sender really sent this message.

The basic components of a cryptosystem are shown on the Figure 1.

single key for both encryption and decryption), public-key cryptography (or asymmetric cryptography, which uses one key for encryption and another for decryption), and hash functions that use a mathematical function to irreversibly encrypt the information [2, 3].

In this work, the investigation of the usage of graph theory in cryptography is undertaken. An idea that information can be transmitted or stored by an undirected weighted graph is presented. The idea applies to the symmetric cryptosystem with the same key for encryption and decryption. Encryption and decryption algorithms based on the usage of graphs are presented.

The paper is organized as follows: after introduction given in section I, the crucial concepts and ideas are given in section II. This section gives an insight to the

idea of information distribution by vertexes, edges and weights in a complete undirected weighted graph. The idea is explained using pseudo-code. Final section III contains conclusions and future work directions.

II. GRAPH THEORY AND CRYPTOGRAPHY

Cryptography is a science, but also an artistry of keeping data secure. Here is presented an alternative approach in the security system design, based on the data storage of a large amount of similar data. Cryptographic algorithm is considered through the encryption and decryption with no details on the key transmission.

A basic assumption is that the data (or information, or message) can be distributed in vertexes, edges and weights in a complete undirected weighted graph

$$G = (V, E, w),$$

with p vertexes $|V| = p$, with $p(p-1)/2$ edges denoted by

$$[i, j] = \{i, j\}, 1 \leq i < j \leq p, [i, j] \in E,$$

and an injective function $w: E \rightarrow N$. The setting up of the information into the weighted graph will not be discussed.

The aim is to store or transmit the weighted graph with contained data safely; therefore, it has to be camouflaged. The weighted graph G will be hidden into a collection of weighted graphs with the same supporting

unweighted graph (V, E) , but different weight functions,

$$G_k = (V, E, w_k), k = 1, \dots, n.$$

The essence of the idea can be seen in Figure 2.

A dimension n should be large enough but bounded with computing capacity. Instead of the whole collection, the only one weighted graph can be considered, but with vector function of weights with hidden initial weight function w ,

$$\tilde{G} = (V, E, \tilde{w}),$$

$$\tilde{w}: E \rightarrow N^n,$$

$$\tilde{w}([i, j]) = (w_1([i, j]), w_2([i, j]), \dots, w_n([i, j])).$$

The data can be transmitted by an emitter or stored in the form of the upper triangular matrix $M_{p \times p}$ containing the vectors of weights. The matrix M is the upper part of the adjacency matrix of the weighted graph \tilde{G} .

According to M , a receiver will generate n weighted graphs. Some additional information should exist upon which the initial graph can be extracted among the collection. A cryptography key will indicate which component of \tilde{w} contains the right data.

Phases of the main idea realization are graphically presented on the Figure 3.

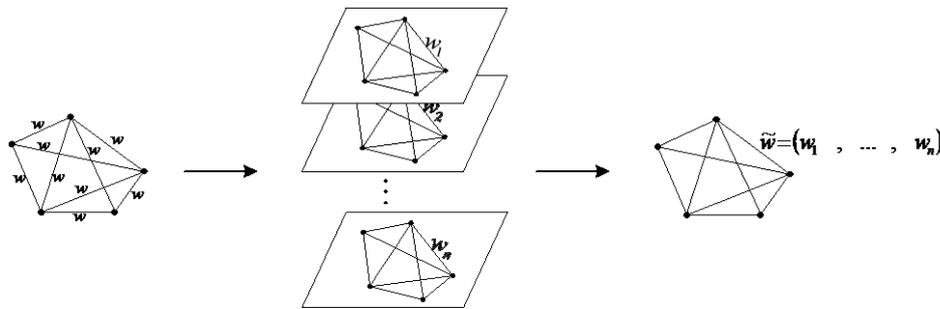


Figure 2. The camouflage process

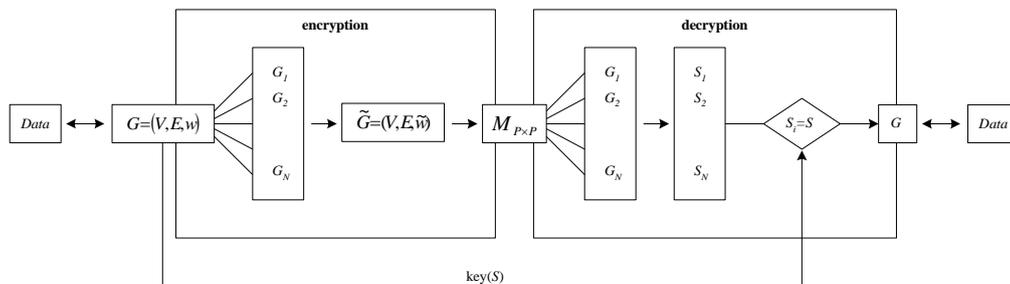


Figure 3. Cryptography based on the Graph Theory

For the initial weighted graph G , some characteristics can be determinate by direct calculation. One of them is a set of weight values,

$$W(E) = \{w([i, j]) \mid [i, j] \in E\},$$

and the second one is minimal weight,

$$m = \min W(E).$$

Furthermore, a minimal spanning tree (*MST*) is uniquely determined for the initial graph, because of the injectivity of the weight function, and it derives from the Kruskal algorithm [5]. Disregarding the weights of the *MST*, the Prufer's procedure [5,6] gives a $(p-2)$ -tuple of vertexes, called Prufer's sequence and denoted by *PS*. Therefore, the Prufer's sequence of the minimal spanning tree of the initial graph is the cryptography key (see pseudo-code in Listing 1). More, it can even exist as a one single natural number labeling at the position of the sequence as a variation of $(p-2)$ class with repetition of p elements, in the lexicographical order.

Listing 1. Initialization

```
V={1, 2, ..., p};
E={ [i, j] | 1<=i<j<=p };
w([i, j]), 1<=i<j<=p;
G=(V, E, w);
W(E)={ w([i, j]), 1<=i<j<=p };
m:=min(W(E));
Emst:= Kruskal procedure (V, E, w);
PS:= Prufer procedure (Emst);
Key:=PS;
```

The key could be sent in advance, or in an alternative way, with no fear that repeated use would generate recognizable patterns. Encryption implies a submersion of the weighted graph G and the representation through the three-dimensional adjacency matrix, M . In general, the third dimension of M can be chosen arbitrarily.

Therefore, the vector function of weights will have n components and one of them, which will overtake the values from the initial one, will be chosen randomly. All the others will take values from the same set $W(E)$, but with additional condition that they produce a different minimal spanning trees and Prufer's sequences. Finally, the elements of the adjacency matrix are defined:

$$M_{p \times p} = [\tilde{w}[i, j]].$$

Details are shown in pseudo-code presented in Listing 2.

Listing 2. Encryption

```
Rand n;
Rand a, 1<=a<=n;
w_a([i, j])=w([i, j]);
for k=1 to n (skip a) do
  e:=Rand(E-Emst);
  X:=W(E)-m;
  for [i, j] in E do
    if [i, j]=e then
      w_a([i, j]):=m
    else
```

```
w_a([i, j]):=Rand(X);
X:=X- w_a([i, j]);
od;
od;
for [i, j] in E do
  \tilde{W}([i, j]):=(w_1([i, j]), ..., w_n([i, j]));
od;
M:=matrix, p x p;
M[i, j]:= \tilde{W}([i, j]);
```

Decryption means an extraction of one single weighted graph from the matrix M . A receiver will generate n weighted graphs, corresponding n minimal spanning trees and their Prufer's sequences, but there will be exactly one matching with the initial sequence contained in the key (see Listing 3).

Listing 3. Decryption

```
for k=1 to n do
  Emst_k = Kruskal procedure (V, E, w_k);
  PS_k := Prufer procedure (Emst_k);
  if PS_k=Key then
    print G=(V, E, w_k);
    break;
  else
    k=k+1;
od;
```

These concepts are presented to show how graph theory based on the encryption and decryption algorithms can be implemented.

III. CONCLUSIONS

The paper presents a way of using concepts from graph theory in the domain of cryptography. Encryption and decryption algorithms, based on the concepts of graph theory are described. The information is distributed in vertexes, edges and weights in a complete undirected weighted graph G . Encryption implies a submersion of the weighted graph G and the representation through the three-dimensional adjacency matrix M , while decryption means an extraction of one single weighted graph from the matrix M . In general, the third dimension n of M can be chosen arbitrarily.

Since dimension n should be large enough, but bounded with rational use of the computing capacity and time, we can conclude that according to topological characteristics of labeled complete graph, it is favorable to chose:

$$n = p(p-1)/2.$$

We can also conclude that the proposed idea is associated with privacy/confidentiality of the cryptosystem, ensuring that no one can read the message except the intended receiver.

Future work will include the implementation of previously described concepts, as well as the experiments with different settings regarding dimensionality of the adjacency matrix.

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Wireless Local Area Network Security Overview

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Abstract - This paper gives overview of certain wireless networks technologies, and described the threats and vulnerabilities associated with security risks in wireless networks, and various countermeasures that could be used to mitigate those risks. The wireless security is illustrates by explaining the basic methods for IEEE 802.11 security and main specifications of the security standards like 802.11 WEP, 802.11 WPA and WPA2 (802.11i).

I. INTRODUCTION

Today, wireless and mobile networks are rapidly extending their capabilities. In addition to their increasing bandwidth and because of their flexibility, wireless communications offer business and personal users many benefits such as: portability, mobility, deployment, scalability and lower installation costs. Wireless technologies cover a broad range of differing services oriented toward different users needs and provide a user the capability to communicate at anytime, with nearly anyone, from anywhere, using a wireless communication channel. This communication channel can also be used as an access to the Internet. Wireless Internet access technology is being increasingly deployed in both public and business environments, as well as by the Internet residential users.

A Wireless Local Area Network (WLAN) is a type of network that uses high radio frequency (RF) waves to communicate between network elements and enabled devices. WLAN devices, such as cell phones, personal digital assistants (PDA) and laptops with wireless card, allow remote users to synchronize personal databases and provide access to network services such as wireless web browsing, e-mail, and Internet access for instance. Also, users can move their laptops from place to place, without losing network connectivity.

However, security is an essential problem for wireless and wired network communications. Wireless technology also creates conditions for new threats and the risk of interception is greater, because communications takes place using electromagnetic waves. A different type of attacks is possible in wireless network, and can be classier according to different criteria, such as the domain of the attackers, or the techniques used in attacks. These security attacks can be classier by the following criteria: passive or active, internal or external, on different protocol layer, noticed or un-noticed, cryptography or non-cryptography related. The overall security objectives remain the same in wireless and wired networks: preserving confidentiality, ensuring integrity, and maintaining availability of the information and information systems.[2]

II. BRIEF WLAN OVERVIEW

In general the wireless networks consist of four basic components:

- The signal that carries the data may be transmitted using electromagnetic waves in the either radio frequency (RF) or infrared frequency (IR) part of the frequency spectrum. Radio part (Tx/Rx) for data transmission using radio frequencies. If RF transport is used then the Spread Spectrum method is employed to generate the signal. Two spread spectrum techniques are the Frequency Hopping Spread Spectrum (FHSS) and the Direct Sequence Spread Spectrum (DSSS).

- Access Points (AP) that provide a connection to the infrastructure network and/or the client devices. Usually, an AP connects to a wired network, and provides a bridge for data communication between wireless and wired devices. WLAN connects laptops and other devices to the network using an AP. An AP communicates with devices equipped with wireless network cards; it connects to a wired Ethernet LAN via an RJ-45 port. AP typically has coverage areas of up to 100 meters. This coverage area is called a cell or range. Users move freely within the cell with their laptop or other client device.

- Client devices-Wireless Stations (WS) can be laptop, smart phone or PDA (Personal Digital Assistant);

- Users.

All these components can be target for attack that can result of one or more of the three fundamental security objectives: confidentiality, integrity, and availability.

WLAN architecture is built from WS and an AP. The basic structure of a WLAN is the Basic Service Set (BSS). A BSS may either an independent (ad hoc networks) BSS or an infrastructure BSS. Ad-hoc mode is one of the networking topologies provided in the IEEE 802.11 standard. It consists of at least two wireless stations where no AP is involved in their communication. Ad-hoc mode WLANs are normally less expensive to run, as no AP-s is needed for their communication.

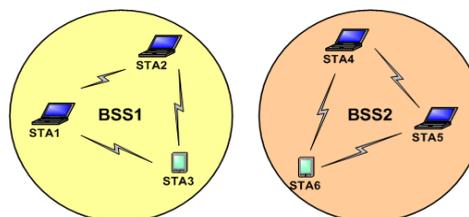


Fig.1 Independent BSS

However, this topology cannot scale for larger networks and lack of some security features like MAC filtering and access control. In an independent BSS, the stations communicate one with another directly if they are within range of each other. Figure 1 illustrates these ad hoc network concepts. [6] [8].

Infrastructure mode is another networking topology in the IEEE 802.11 standard, in addition to ad hoc mode. It consists of a number of WS and AP. An infrastructure BSS requires the use of an AP, with association WS to an AP. The AP is used for all communications between stations. Figure 2 illustrates infrastructure BSS.

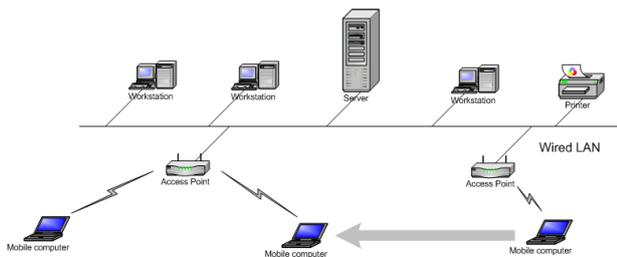


Fig.2 Infrastructure BSS

III. SECURITY ATTACKS

The majorities of wireless communications use the RF spectrum and broadcast by nature. The broadcast nature of WLAN-s, in the range of wireless transmission from 100 to 800 meters, makes it easy for attack if the network is not secured. Most of the security attacks and threats are listed below. [3]

- **Traffic Analysis:** in this type of attacks the attacker uses the statistics of network connectivity and activity to find information about the attacked network. Information includes: AP location, AP Service Set Identifier (SSID) and the type of protocol used by the analysis of size and types of packets [5].

- **Eavesdropping:** is the intercepting and reading of messages and conversations by unintended receivers. Signals broadcast over airwaves can be easily intercepted with receivers tuned to the proper frequency. There are two type of eavesdropping:

- **Passive Eavesdropping:** the attackers in this type set themselves in sniffing mode, where they listen to all the network traffic hoping to extract information from it. This type of attack is only useful with unencrypted networks and stream cipher encrypted ones.

- **Active Eavesdropping:** similar to passive eavesdropping but the attacker tries to change the data on the packet, or to inject a complete packet in the stream of data.

- **Unauthorized Access:** this is the most common attack type where the attacker tries to get access to a network that she is not authorized to access. Mainly the reason behind such attacks is just to get Internet access for free. [1].

- **Man-in-the-middle attacks:** in this attack, the attacker gets the packets before the intended receiver does. This allows her to change the content of the message. One of the most known subset of this attack is called Address Resolution Protocol (ARP) attacks, where the attacker redirects network traffic to pass through her device [3]. A man-in-the-middle attacker entices computers to log into a computer which is set up as a “soft” AP. Then the attacker connects to a real AP through another wireless card offering a steady flow of traffic through the transparent attacking computer to the real network. The attacker can then sniff the traffic. Man-in-the-middle attacks are enhanced by software such as LANjack and AirJack, which automate multiple steps of the process.

- **Session High-Jacking:** the attacker attacks the integrity of the session by trying to hijack an authorized session from an authorized user.

- **Replay Attacks:** in this type of attack the attacker uses the information from previous authenticated sessions to gain access to the network.

- **Rouge AP:** some of the devices allow the user to declare itself as an AP. This will make people confused and sometimes they may connect to this false AP exposing their information to it. This can be solved by imposing mutual authentication between AP and network devices.

- **DoS (Denial of Service) Attacks:** DoS attacks are the hardest type of attacks to overcome. Attackers use frequency devices to send continuous noise on a specific channel to ruin network connectivity. It is known in the wireless world as RF jamming. A DoS occurs when an attacker continually bombards a targeted AP or network with bogus requests, premature successful connection messages, failure messages, and/or other commands. These cause legitimate users to not be able to get on the network and may even cause the network to crash. [5]

There are many other threats that can be placed under one of the categories above. These different types of attacks make it harder for a people who are engaged in standardization to find the best way to come up with the best solutions to the security hazards without sacrificing network usability or speed.

IV. SECURITY OF IEEE 802.11 WLAN

In the IEEE 802.11 specification the security services are provided for the most part by the Wired Equivalency Privacy (WEP) protocol to protect link-level data during wireless transmission between WS and AP-s. WEP does not provide end-to-end security, but only for the wireless part of the connection. [6]

The IEEE defined three basic security services for the IEEE 802.11 WLAN:

- **Authentication.** A primary goal of WEP was to verify the identity of communicating WS. This provides access control to the network by denying access to client stations that cannot authenticate properly.

- **Confidentiality, or privacy,** was a second goal of WEP. The intent was to prevent information compromise from casual passive attack.

- **Integrity.** Another goal of WEP was to ensure

that messages are not modified during wireless transmission between WS and the AP in an active attack.

The IEEE 802.11 standard did not address other security services such as audit, authorization, and no repudiation.

A. Authentication

The IEEE 802.11 specification defines two way of authentication when WS attempting to access to a wired network:

- Open-system authentication. In the open-system authentication technique AP accepts the WS without verifying the identity of the station. This type of authentication is only one way, only the WS is authenticated. Open-system authentication without cryptographic validation is highly vulnerable to attacks.

- Shared-key authentication. This type of authentication is a cryptographic technique for authentication. In this scheme, a random sequence is generated by the AP and sent to the WS, who using a cryptographic key (that is shared with the AP), encrypts the random sequence and returns the result to the AP. The AP decrypts the result computed by the client and allows access only if the decrypted value is the same as the random sequence transmitted. The algorithm used in the cryptographic keys of 40 bits, though some vendors have implemented 104 bits and even 128 bits.

B. Confidentiality

In the IEEE 802.11 standard for confidentiality also uses the WEP technique and RC4 symmetric key, stream cipher algorithm to generate a pseudo-random data sequence, thus data can be protected from disclosure during transmission over the radio interface. WEP is applied to all higher layers to protect traffic such as TCP/IP, IPX, and HTTP.

C. Integrity

The IEEE 802.11 specification provides data integrity for messages transmitted between WS and AP. This technique uses a simple encrypted Cyclic Redundancy Check (CRC) approach. A CRC32, or frame check sequence, is computed on each payload prior to transmission. The integrity sealed packet is then encrypted using the RC4 key stream to provide the cipher-text message. On the receiving site, decryption is performed and the CRC is recomputed on the message that is received. The CRC computed at the receiving end is compared with the one computed with the original message. The simple CRC is not a secure mechanism such as a hash or message authentication code.

V. THE BASIC METHODS FOR IEEE 802.11 SECURITY

Three basic methods are used to secure access to an AP and provide a secure wireless channel:

- Service Set Identifier (SSID)
- Media Access Control (MAC) address filtering
- Wired Equivalent Privacy (WEP)

One or all of these methods may be implemented, but all three together provide the best solution.

A. The Service Set Identifier-SSID

The Service Set Identifier (SSID) provides a method to control access to an AP or set of AP-s. Each AP is equipped with an SSID that corresponds to a specific WLAN segment. To be able to access a particular WLAN the WS must be configured with the appropriate SSID and must present the correct SSID to access the AP. For users who require access to the WLAN from different locations a WS can be configured with multiple SSID-s. The SSID acts as a password and provides a measure of security.

B. MAC address filtering

A client WS can be identified by the unique MAC address of its wireless network card. To ensure AP access control each AP can be equipped with a list of MAC addresses associated with the client WS allowed to access the AP. If in this list a clients MAC address is not included, the client will not be able to access the AP.

C. Wired Equivalent Privacy-WEP

The WEP protocol has three components:

- A shared secret key, k (40bit/104bit/128bits): This shared key is never sent over the radio interface. The IEEE 802.11 specification doesn't discuss the deployment of this key onto WS. It has to be installed manually at each WS/AP. Most AP-s can handle up to four shared secret keys.

- Initialization vector (IV) contains 24 bits: IV is a per packet number that is sent in clear over the radio interface. This number is most effective if generated randomly, because it is used as one of the inputs to the RC4 algorithm. IEEE 802.11 standards don't specify generation of IV. Infact, many cards generate IV-s in linear fashion, i.e., 1, 2, 3, etc.

- RC4 algorithm, RC4 (IV, k): This algorithm is used to generate a key stream K , length equal to that of the message to be transmitted by the data link layer. It takes the IV and k as inputs.

Wired Equivalent Privacy (WEP) Protocol is a basic security feature in the IEEE 802.11 standard, intended to provide confidentiality over a wireless network by encrypting information sent over the network. WEP encryption is vulnerable to attack. A scripting tools exist that can be used to take advantage of weaknesses in the WEP key algorithm to attack a network successfully and discover the WEP key. The Advanced Encryption Standard (AES) is identified as a possible replacement encryption technology for WEP. The WEP is replaced by AES in IEEE 802.11i WLAN standard.

Wi-Fi Protected Access (WPA) is a wireless security protocol designed to address and fix the known security issues in WEP. The WPA provides users with a higher level of assurance that their data will remain protected by using Temporal Key Integrity Protocol (TKIP) for data encryption. The IEEE 802.1x authentication has been introduced in this protocol to improve user authentication.

Wi-Fi Protected Access 2 (WPA2), based on IEEE 802.11i, is a new wireless security protocol in which only

authorized users can access a wireless device that applies AES, and Extensible Authentication Protocol (EAP), for authentication control. [1]

VI. RISK MITIGATION AND COUNTERMEASURE

The WLAN operator and customers can mitigate risks to their WLAN-s by applying countermeasures against specific threats and vulnerabilities. The set of countermeasures means: management countermeasures, operational and technical countermeasures and their combinations.

A. Management countermeasures

- Provide the network administrators which are fully aware of the present security risks. Management countermeasures for securing WLAN mean an introduction a comprehensive security policy. A security policy, and compliance control, is the basis for other countermeasures. A WLAN security policy should be able to do the following:

- Describe the hardware and software WLAN configuration.
- Describe who can install AP and other wireless equipment and provide limitations on the location of and physical security for AP.
- Define standard security settings for AP and provide guidelines on the use of encryption and key management.
- Identify whether Internet access for WLAN is required.

B. Operational countermeasures

The most fundamental step for ensuring is that only authorized users have access to WLAN is the physical security. Physical security means a combination of access controls, personnel identification, and external protection.

C. Technical countermeasures

The technical countermeasures include the use of hardware and software solutions. The software countermeasures include proper operational and security settings on an AP, software upgrades, authentication, intrusion detection systems (IDS), and encryption. Hardware solutions include use of smart cards, Virtual Private Networks (VPN-s,) Public Key Infrastructure (PKI), etc.

VII. CONCLUSION

The risks are inherent in any wireless technology. The

one, perhaps most significant source of risks in wireless networks and systems is that the communications medium, free space for propagation of radio waves is open to the attacks.

The risks typically associated with wireless communications are loss of confidentiality and integrity and the threat of Denial of Service (DoS) attacks. The unauthorized users may access to wireless networks and their information, corrupt data, degrade network performance, consume network bandwidth, and prevent authorized users from accessing the wireless network or use resources to launch attacks on other networks.

The problems associated with to the design of WEP demanded solutions. The standardization body is working to solve these problems. It is developing solutions based on the 802.1x specification, which includes EAP.

It is quite clear that it is not possible to totally eliminate all risks associated with wireless network and systems. With all proposed new technologies and security standards over the last years to solve the wireless security problems, we still cannot say that wireless networks are secure. Currently, it is possible to achieve a reasonable level of overall security by adopting a systematic approach to assessing and managing risk.

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STUDENTS' PAPERS

Pascal as a First Programming Language for Learning Object – Oriented Programming

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Abstract - Object-oriented programming has, in recent years, become the most influential programming paradigm. In this paper we give some remarks on the problem of teaching object-oriented programming for novices. The main topic discussed in this paper is choosing Pascal as a first programming language for learning object-oriented programming. We will give some answers why Pascal is the best choice, comparing it with other modern object-oriented programming languages C++ and Java.

I. INTRODUCTION

Object-oriented programming languages are used at university courses at all levels throughout the world [1]. Much has been reported on the experiences of teaching the object oriented paradigm [2][3][4][5]. Object-oriented programming (OOP), is experienced as difficult to learn, and programming courses often have high dropout rates. Difficulty arises from the structure, syntax and semantics of the programming languages which are commonly used to teach OOP, like C++ or Java.

The main source of difficulty does not seem to be syntax, but rather basic program planning [6]. A student can learn to explain and understand a OO programming concept, e.g., what the virtual method means, but still fails to use it appropriately in a program.

The choice of the first OO programming language is therefore an important step for learning OOP. Learning OOP is not just about learning some OO programming language, but understanding the key concepts of OO paradigm:

- Encapsulation
- Inheritance
- Polymorphism

Related topics involve objects, classes and data hiding.

An OO language provides a way to couple or encapsulate data and its functions into a unified entity. This is a more natural way to model real-world entities which have both data and functionality. The class structure of the OO program made it a bit easier to understand program entities, but not so easy to understand program flow, data flow and ”hidden“ actions (e.g. constructor or destructor calls).

McIver and Conway suggest that when evaluating a potential teaching language, in addition to addressing the usual considerations (such as language paradigm, compiler availability, textbook quality, etc.), educators should also bear in mind the seven key questions, popularly called “seven sins” (details can be found in [7]).

Considering these seven questions, we may define some important characteristics of a good first OO programming language as follows:

- The syntax of the language should not be too complex and not too big (over-featured);
- Elements of the language (such as control structures, operators, inbuilt functions, etc.) should be reasonably mnemonic;
- Semantics of the language should not be complicated;
- The error diagnostics should be clear and meaningful at a novice’s level of understanding;
- The language should be hardware independent;
- The language must support the key concepts of OOP, like encapsulation, inheritance and polymorphism.

II. OBJECT PASCAL

Pascal has always been popular among students, primarily because of its development environment that comes with a lot of support and documentation. After all, the main purpose of Pascal is learning structural programming.

Two decades later, when OOP became popular, Borland decided to add OOP features to their famous Turbo Pascal line. After the success of Turbo Pascal, Borland ported it to Windows and introduced component driven technology to it. Soon Delphi became the best RAD tool at that time.

Nowadays, when there are many OO programming languages (such as Object Pascal, C++, Java, etc.) the key problem is to find the best language for learning OOP.

Let us consider now why Pascal is the best choice for learning OOP concepts. We will compare it with other modern OO languages (C++ and Java) guided by six characteristics mentioned in Introduction.

A. Pascal vs. C++

C++ is the most common OO language. The language began as enhancements to C, first adding classes, then virtual functions and operator overloading, among other features. But some features like multiple inheritance, templates and exception handling may be quite confusing and hard to understand for novice programmers.

On the contrary, Pascal has only basic OO features like objects, constructors, destructors, virtual functions and abstract objects. Unlike Pascal, C++ is too big (over-featured) for beginners.

One more confusing thing about C++ is quite complex syntax and mnemonic. For example, abstract class in C++ is declared using *pure specifier* (= 0) in the declaration of the virtual member function in the class declaration:

```
virtual void Example() = 0;
```

Pascal uses keyword *abstract*, instead:

```
procedure Example; virtual; abstract;
```

This is more understandable for novices.

Another example is declaring constructor or destructor. In C++ they have the same name as the class they belong to (Fig. 1).

```
class XYPoint {
private:
    int x,y;
public:
    XYPoint(){}
    XYPoint(int, int){}
    XYPoint(const XYPoint&){}
    ~XYPoint(){}
};
```

Figure 1. Example code in C++

This is very confusing for novices, because the “XYPoint” is everywhere in the code.

Pascal uses a keyword for constructor and destructor as shown in Fig. 2.

```
XYPoint=object
    constructor InitWithoutParam;
    constructor InitWithParam(x,y:integer);
    constructor InitCopy(point:XYPoint);
    destructor DeletePoint;
private:
    x,y:integer;
end;
```

Figure 2. Example code in Turbo Pascal

Comparing the codes from Fig. 1 and Fig. 2, we can see that Pascal code is much easier to understand. In Pascal, we can use any valid name for constructor and destructor, while in C++ we must use the same name as class.

For novices, destructor *DeletePoint* (from Pascal) is more practical than *~XYPoint()* (from C++), which is obvious.

Not to mention some other elements of the language (e.g. arrays, data types, files) which are more mnemonic in Pascal than C++. For novice programmers, mnemonic

names are important for understanding and learning. Thus, keywords *begin* and *end* which represent block in Pascal are more mnemonic convenient than brackets { } in C++.

B. Pascal vs. Java

Java is a relatively new language. Java has all the characteristics of a programming language. It was designed to be a safe, OO language, with a very strong focus on “what to do” rather than “how to do”. Consequently, Java is highly standardized, strongly typed language, and has a very rich set of APIs [8].

Java is an often-used first programming language in introductory programming courses for university students. There are many reports on problems with teaching Java [4], pointing out difficulties to understand central concepts in the object-oriented paradigm [7].

Java is a true OO language. That means that it is not possible to write program that is not OO. A minimal code of Java program is shown in Fig. 3.

```
class ExampleApp {
    public static void main(String[] args) {
    }
}
```

Figure 3. Minimal code in Java

The program from Fig. 3 does nothing. Still, it necessarily contains terms like *class*, *public* and *static*, which novice programmers have not met yet. This is the first obstacle for novices since the beginning programming in Java.

Let us go back to story about constructors and destructors from section A. Equivalent example of the code from Fig. 1 and Fig. 2 is shown in Fig. 4, only in Java this time.

```
public final class XYPoint {
    public XYPoint();
    public XYPoint(int x, int y);
    public XYPoint(XYPoint Point);

    private int x;
    private int y;
}
```

Figure 4. Example code in Java

As we can see, there are not many differences when compared to C++ for the same example (Fig. 1). This is not surprising, because Java was influenced by C++. Therefore, syntax of Java is very similar to C++. Problems that we discussed about C++ apply to Java.

Some teachers prefer Java as the first OO language, because it is modern. However, being modern is a relative term. Java may be modern language today, but does not mean that it will be modern for the next five or ten years. Modernity certainly is not something that should be leading criterion for choosing the first OO language for novice programmers.

Important thing for novices is compiler of the programming language. Java compiler is not friendly for beginners. If there is an error, there are so many possible reasons for it, that just displaying some of the most probable ones may confuse not only the beginner. Only a compiler of a simple language like Pascal is in a so comfortable situation, that it is *possible* in most cases to clearly state to the user the cause of its mistake. [3]

III. THE COURSE

At University of Novi Sad, Technical Faculty "Mihajlo Pupin" in Zrenjanin, Pascal takes the central point of the curriculum on the course Basics of programming. This course is being studied at undergraduate level in the second semester. The course carries 8 ECTS points, with 3+3 hours per week.

The course is realized through:

- Theoretical classes
- Practical exercises in computer laboratory

The main purpose of the course is introducing students with the basic concepts of the programming techniques and programming languages through Pascal.

The course covers the following topics:

1. Introduction
2. Algorithms and data
3. Principles of programming languages
4. Structural programming
5. Programming language Pascal
6. Basics of software engineering
7. Object programming

Most topics are related to structural programming. We know that learning OOP is impossible without knowledge of structural programming. It is very important to introduce students to the basics of structural programming, such as data types (including arrays and records), files, and subprograms.

Depending on the acquired knowledge, a teacher may introduce students with pointers and dynamic data structures (e.g. lists, stacks and queues). But, for the first year students this is not necessary.

Last but not least is Object programming. In this topic students are introduced to basic OOP concepts.

Students learn Pascal (structural programming) during the whole semester. That is why the Pascal is the best choice for the last topic (OOP). Continuing with Pascal is more convenient for students and teachers, rather than switching to another OO programming language (C++ or Java). Not to mention that students do not have experience in other languages, except in Pascal.

In the further studying, students have other courses where they learn full OO programming:

- Methods of programming (C++)
- Internet programming (Java)

It is easier to follow these courses, since students are already introduced with OOP in first course.

IV. CONCLUSIONS

In this paper we have tried to show why choosing Pascal as the first OO language is the best choice for learning OO programming.

We had compared it with other modern OO languages (C++ and Java), and came to the following conclusions:

- Pascal is a simple language;
- Pascal uses reasonable mnemonic names for its elements;
- Pascal's compiler is friendly for novices;
- Most of the students have the basic knowledge of structural programming in Pascal;
- Pascal supports the key concepts of OO programming: encapsulation, inheritance and polymorphism.

Our aim has not been to show that C++ or Java are bad languages. Languages cannot be good or bad *per se*; they are good or bad *for a specific purpose*. A language that is bad in one context can be excellent in another (or vice versa) [5].

For example, Java is a good choice for Internet programming. Many Internet applications are based on Java and Java applets.

C++ is probably the best choice for system programming. Some of its elements are low-level (e.g. bit operators). It is the most frequently used for OO programming, primarily because it has advanced OOP concepts like multiple inheritance, templates and exception handling.

Talking about learning OO programming, Pascal is certainly the best choice. It is very popular among students and it will stay popular for a long time.

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Some Aspects of Data Privacy Protection in Internet Marketing in the EU and Serbia

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Abstract - Contemporary business trends indicate the intensification of global expansion of activities based on the usage of possibilities and potential of internet marketing. As internet marketing is a new and propulsive area of business susceptible to constant changes, there are numerous possibilities to perform various forms of fraud and abuse that greatly endanger the privacy of consumers. Therefore, it is necessary to innovate the ways of regulating this area, since the rules and control mechanisms of classic marketing are no longer applicable to contemporary conditions. The problem that mostly concerns consumers is related to the adequate protection of personal data and prevention of their unauthorized use. Under such circumstances, legislature must play a key role in building trust between direct marketers and consumers, and in regulating their mutual relations. Modification of existing legislation in the field of data protection and setting of unique, lucid and neutral regulatory framework should be approached primarily. This paper particularly emphasizes the need for data privacy protection, along with the analysis of efforts made in defining regulatory frameworks in the European Union and Serbia.

I. INTRODUCTION

Problems and open issues related to data privacy and consumers' rights have always existed, as well as attempts to regulate them through numerous laws and regulations. Contemporary information and communication technologies have rapidly shifted the boundaries of privacy. However, the fact that all has its limits is confirmed by frequent public debates on this topic, as well as the latest data which show that around 80% of European citizens believe that the right for privacy comes immediately after the right to live and be free.

We can safely conclude that, from consumers' perspective, data protection is certainly the most important. But, while in the protection of these rights in traditional commerce one could use developed case law and numerous legal provisions, the position of consumers in internet marketing is uncertain. Infinite ease is a characteristic of electronic data handling rather than traditional paperwork. Copying books in the "Middle Ages" lasted for years, and until recently the same procedure had been carried out quickly only by using rare devices available to a small number of people. Currently, the situation is completely different. With just one mouse-click on a personal computer, one can access a large number of data and information. These challenges require that the legislation in the field of data protection provides adequate solutions and ensures maintenance of consumers' confidence in internet marketing. The main

problem for consumers is collecting sensitive personal data, and the possibility of their abuse in order to create consumer profiles, as well as complete dossiers about their purchasing habits, interests and the like. Therefore it is necessary to mobilize the public and raise awareness among people about the need for privacy protection. One of the possible solutions is to outline unique, global laws that would ensure effective control over data and information collection, as well as transparency of their further use.

The aim of this paper is to emphasize the exceptional role of legal norms in regulating the problem of consumers' data privacy protection, and to highlight their contribution to the development and dissemination of trust in internet marketing activities. Also, special attention will be paid to the legislation of the mentioned field in the European Union with reference to the current circumstances and future prospects of data protection in Serbia.

II. NEED FOR DEFINING LEGAL NORMS TO REGULATEDATA PRIVACY PROTECTION

One of the most controversial topics that not only intensely involve governments around the world, but also many non-governmental organizations is related to privacy and protection of personal information of consumers. Currently, due to the widespread use of the Internet and direct marketing, privacy issues are becoming increasingly important. "Online business" uses demographic information (for example, personal information of credit card numbers), giving the consumer a fear of performing "online shopping activities." According to some estimates, as many as 77% of Internet users have never purchased a product online, and nearly 86% showed a fear that other users could use their credit card numbers, which is private information according to them [1]. All this suggests that the issue of protection of consumer privacy in one of the most important issues of internet marketing. Of course, the problem lies not in the fact that internet marketing has become one of the key selling strategies, but in the unauthorized use and sharing of personal information of consumers. Even in the first European directives dealing with this issue it was well known that data collected for one purpose cannot be used for any other purpose without the consent of the individual whose data were in question. This meant that the individual actively brought decisions on any new use or sharing of information. However, experts in Internet marketing, and legislative authorities as well, were prone to liberal interpretation of this provision. They believed that the consent of the consumer to use his or her personal

data for marketing purposes would also permit them to trade with a third party if it would use the data for marketing purposes.

Although it seems that the right to privacy came into the focus of public interest along with the expansion of new technologies, legal science has been dealing with it for more than a century. One of the earliest definitions is that it is "the right to be left alone," but today it is much more discussed from the standpoint of property rights over the information and their use. Moreover, a recent survey showed that respondents are more concerned about the disclosure of information held by various agencies and companies rather than environmental control. The reason lies in the fact that the data collected through internet marketing are so valuable that many investigation bureaus and tax services have been interested in them lately.

Privacy issues include the right to be free from unreasonable personal intrusions and so we can safely say that it has been a legal and social issue of a large number of countries for many years. Today the right of privacy is recognized in its virtual form and it is closely related to the following characteristics [2]:

- the right of privacy is not an absolute right and it balances in relation with the needs of the society, and
- the right of publicity is superior to the right of individual privacy.

According to this, we can conclude that the right of privacy and its protection are a very sensitive issue and therefore it is very difficult to identify and define specific legislation.

III. LEGISLATION IN THE FIELD OF DATA PRIVACY PROTECTION

Every individual has a right to know which personal information about him or her are collected, how they are processed and for what purposes they are used. Consumers must be given the possibility of checking personal data stored in various databases and registries to decide independently whether these data can be used in internet marketing. One of the basic principles of protection of data confidentiality is the principle of ownership over stored data that clearly defines who is responsible for ensuring the protection of data and who determines the possibility to access the data (ISO/IEC 17799 norm). There are many situations in which the data must not be available to the general public because their general availability could be misused for any reason and in any manner. Some information must be kept secret due to the need to protect the general, common and business interests, and some for the protection of individual privacy. Therefore, concrete measures to protect the insight and access to confidential information against unauthorized persons must be taken. In the case law of many countries, this issue is approached in different ways, which we will to explain through the examples of the European Union and Serbia.

A. *Data privacy protection in the European Union*

In Europe, privacy is regulated much more strictly than in the US. In the US, private companies and organizations are permitted to use personal information collected in commercial transactions for other business purposes, without prior consent of the consumers [3]. In the US there is no federal agency responsible for enforcing the Law on Privacy, but instead the Law on Privacy is being implemented mainly through self-regulation by companies or individuals. The European approach to privacy protection has a more comprehensive and regulatory nature. European countries do not allow companies to use personal information collected from consumers without their prior consent. Privacy laws are implemented through establishing data protection agencies that take care of consumer complaints and enforcement of the laws in practice [4].

The Directive on Data Protection (*DPA*), a decision made by the European Commission in 1998, provides standardization and extension of the protection of privacy in all EU countries. The Directive is based on the principle of Fair Information Practices (*FIP principles*) with the extension regarding giving consumers control over their personal information. The Directive requires companies to inform consumers when collecting information about them, and about the ways the collected information are stored and used. Consumers must give their consent before the companies begin to use the data about them. They also have the right to access the information, the possibility of their correction, as well as to prohibit the collection of further information for marketing and other purposes. The Directive prohibits the transfer of personal data to those companies or countries that do not have a similar privacy policy. This means that the data collected in Europe by US companies may not be transferred or processed in the United States (which has less severe privacy laws). However, the Ministry of Commerce of the EU in cooperation with the European Commission has developed a security policy, the so-called "Safe harbor" principle for American companies. The companies that decide to participate in this program must develop a privacy policy that meets the European standards and enroll in the Web Registry kept by the Ministry of Trade of the EU [4].

In essence, the DPA operates in two directions: on the one hand it grants certain rights to individuals, and on the other it forces those who collect personal information on consumers to inform them about the purpose and manner of their use, as well as to follow the proper guidelines. The Directive requires companies to provide detailed descriptions of [5]:

- data stored,
- the purposes for which the data may be used,
- sources from which the information are collected,
- third parties to which the information may be passed and
- countries or companies to which the information can be transferred.

The Directive includes eight principles which represent obligations for those companies that collect and use personal information on consumers. Basic principles of data manipulation are as follows [5]:

1. Handling data must be fair and lawful.
2. Data can be collected and used only for specific, clear and legitimate objectives.
3. Only those data that are relevant for mentioned purpose may be collected, and the availability of data should be granted only to those who are registered.
4. Provide accurate and updated information.
5. Take all necessary steps to correct or delete inaccurate information.
6. Data storage time should not be longer than required for the purpose for which the data are collected.
7. Ensure security of data against accidental or unauthorized access or manipulation. However, the data must be available to the data subject (the person whose personal data is processed) who, if necessary, shall be entitled to correct or delete any information about him/her.
8. Guarantee the implementation of safety measures in the event of data transfer abroad.

The Directive also provides the following rights to data subjects presented at follow picture [5]:

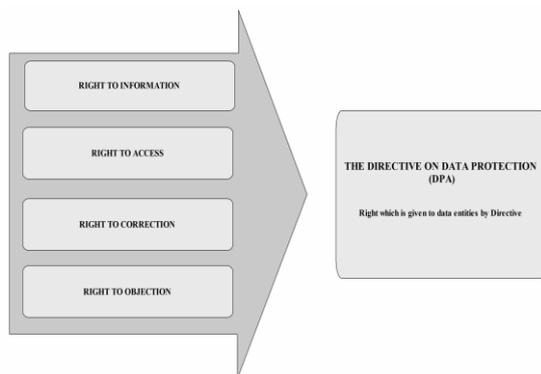


Figure 1. DPA Rights

The right to information means that the data subject must always know when the data about him is collected, whereas the right to access provides secure access to the data in whatever form they are (text, images, etc.). Respecting the correction right, the subject has the possibility of correction or deletion of certain data. His/her last right leaves space for giving objection on certain data and information collected about him/her.

The abovementioned data protection principles apply to information regarding individuals, not organizations. If the data subject believes that there is a violation of one of the principles (or any other provision of the Law), but is unable to independently solve the problem, he/she can complain to the Commissioner for Information. If the Commissioner finds that the complaint is justified, and

that it cannot be resolved informally, then he may decide to send a notification to the user of the data. On the other hand, the user of the data can appeal to an independent court for data protection. If it gets proven that a crime was committed, the Commissioner may pursue the user in court. However, the abovementioned principles of privacy are extremely broadly and vaguely defined, so it is very difficult to determine how much information is “relevant” or what constitutes “reasonable” activities, and as a result, to prove a criminal offense is very difficult as well. It is important to emphasize that there is a large number of exemptions from the DPA, which enables companies and other organizations to collect and keep personal data under certain circumstances. Also, this does not make it easier for consumers to understand and exercise their rights. As a result, the public is aware of a very small number of cases of data abuse and there are an even smaller number of achieved successes in proving the guilt of companies. Another reason for such a low rate of prosecution results from the fact that although the Information Commissioner is obliged to consider all objections, he does not have the authority to initiate an investigation against the registered users of data or the power to compel the companies to pay compensations to data subjects [5]. However, the legislation provides a useful framework that companies must follow, and provides an opportunity for individuals in the EU, who are concerned about their privacy, to obtain the necessary information and support.

With the increase in the number of international consumer transactions, international transfer of data has increased significantly as well. It became necessary to regulate such cases, mainly because some countries do not guarantee unconditional protection of data transfer. It is the eighth principle of the EU Directive on Data Protection that prohibits the transfer of personal data outside the European Economic Area (EEA) unless that country provides adequate protection for the rights and freedom of data subjects. This causes some problems because of the difficulties in adequate assessment of the level of protection, and requires the execution of certain checks [5]:

- If the data intended for transmission, they can be accessed from Web sites in the destination country.
- If the destination country is within the EEA then the transfer will not affect the eighth principle of the Directive on Data Protection, but there are other regulations that must be followed.
- There are certain exceptions to this rule, for example, if the company uses a Web site for selling goods abroad, it can take the names and addresses of customers for delivery.
- When it comes to countries outside the EEA, the European Union publishes a list of countries with the appropriate level of protection.
- For countries that are not on the list of “safe countries”, adequacy tests are performed.

The last Directive on Privacy and Electronic Communications from 2002 (the Directive 2002-58 EC- Concerning the Processing of Personal Data and the Protection of Privacy in the Electronic Communications) requires the provision of basic rights and freedoms to natural persons in relation to the processing of personal data, especially when it comes to privacy rights, to ensure the free flow of personal data [6]. The goal of this directive is to protect the fundamental rights and freedoms of natural persons, in particular their right to privacy, as well as legitimate interests of legal persons in relation to the processing of personal data.

B. Data privacy protection in the Republic of Serbia

The protection of personal data is guaranteed by the Serbian Constitution and the Charter of Human and Minority Rights. The Law on Personal Data Protection regulates the conditions for collecting and processing of personal data, the rights of individuals and the protection of rights of persons whose data are collected and processed, restrictions on personal data protection, the procedure before the competent authority for personal data protection, data security, records, the transfer of data outside the Republic of Serbia and supervision over the implementation of this law. The protection of personal data is performed by the Commissioner for Information of Public Importance and Personal Data Protection, as an autonomous state body, independent in the exercise of its jurisdiction.

The objective of this Law is to, with regard to the processing of personal data; provide each natural person with the protection of privacy rights, and other rights and freedoms. According to this law, data processing is prohibited if [7]:

- the individual has not given his/her consent to the treatment, or if the processing is done without lawful authorization;
- it is done for a purpose other than that for which it was intended, regardless of whether it is done on the basis of consent or legal authorization for treatment without consent;
- the purpose of treatment is not clearly defined, if it is altered, unauthorized, or already accomplished;
- the person to whom the data relate to is specific or identifiable after reaching the purpose of processing;
- such manner of processing is not permitted;
- the data being processed are unnecessary or unsuitable for realizing the purpose of processing;
- the amount and type of data to be processed is disproportionate to the purpose of processing;
- the data are false and incomplete, i.e. not based on a credible source or are outdated.

The operator that collects information from the persons concerned, or from another person, shall inform

the person to whom the information relates, or any other person, prior to collection, about [7]:

- his/her identity and the name and address or company, or the identity of any other person responsible for processing data in accordance with the law;
- the purpose of collecting and further processing;
- the manner of data use;
- the identity of the persons or categories of persons using the information;
- obligation and legal basis regarding voluntary data provision and processing;
- the right to revoke consent to processing, and legal consequences in the case of revocation;
- rights of data subject in the event of unlawful processing;
- other circumstances who's withholding against the data subject or another person would be contrary to good faith actions.

The data related to nationality, race, gender, language, religion, political party affiliation, union membership, health, victims of violence, criminal charges and sex life may be processed based on the freely given consent of the person, except when the law prohibits the processing of such data even with consent. Processing of sensitive data is prohibited, except in certain cases (e.g. with consent given by the data subject). Consent to the processing of particularly sensitive information is given in writing, including the designation of the data being processed, the processing purpose and manner of their use. The individual has the right to request that the operator accurately and fully informs him/her about [7]:

- whether the operator is processing data about him/her, and what kind of processing operations will be performed;
- which data about him/her are being processed;
- from whom the data were collected, i.e. who is the source of data;
- for what purpose and on what legal basis are the data being processed;
- which data collections contain information about him/her;
- who are the recipients of data;
- which data, i.e. what kind of data are being used;
- what are the purposes of using data about him/her;
- on what legal grounds are the data being used;
- to whom are data transferred to, and which data;

- purposes for which the data are transmitted;
- on what legal basis the data are transmitted;
- during which period of time the data will be processed.

According to the Law, the individual has the right to request from the operator to have insight into the data relating to him. The abovementioned includes the right to review, read and hear the data and to make notes. Also, the individual has the right to terminate and suspend processing, if he doubts the punctuality, completeness and accuracy of data, as well as the right to mark such information as disputed, until their punctuality, completeness and accuracy are confirmed.

In our country, there is a present and developing awareness of the need to regulate the issue of privacy in internet marketing, by developing legal practices and other measures, by inclusion of consumers' interests in the formulation of legislation, amending consumer policy, strengthening consumer associations and their active participation in the decision-making process. However, the Law on the protection of personal data is inaccurate and inconsistent with international standards, and deficiencies are such that it is impossible to upgrade, so it is desirable to make a new one as soon as possible. Of course, modern international standards do not guarantee an absolute right of privacy, because there are always areas in which those rights are significantly restricted, such as government and public safety, criminal prosecution, and all the situations where the public interest outweighs the individual.

IV. CONCLUSION

We live in an information society, in which power and wealth largely depend on information and knowledge as a central asset. The controversies that arise around the collection and use of information are the result of companies' battles to increase their strength, power and influence on the market in such a manner. Therefore, the protection of data and information is one of the most important issues from the consumers' point of view. Governments of most developed countries are intensely trying to keep under control, through laws or unwritten

rules, the protection of all data related to existing and potential customers. Generally speaking, in the future we should expect the emphasizing of importance of laws that directly or indirectly relate to this issue in an effort to increase consumer confidence in Internet marketing activities. Internet marketing is an activity that is in the growth phase and every day it gets more and more important, especially because of the great impact it has on the creation and maintenance of partnerships between companies and users, i.e. consumers. Since Serbia has recently become a candidate for membership in the European Union, it is necessary to commence on time the process of adapting our own laws on privacy and data protection of Internet users. The European Commission has defined new rules which guarantee greater control over personal information on the Internet, and that should start to be applied by the end of 2013 after being ratified by all member states of the European Union. According to these rules, the responsibility of society to protect user data would be much larger; each user would be entitled to remove their data from the network, as well as profiles and e-mail accounts if he wants to. This would resolve some of the current issues about who retains user data, whether the companies use them properly, are they allowed to keep them at all, and in what time frame. New measures aim to provide Internet users with the ability to be the owners of their own data, not a web page, social network, or the company to which the data were made available for a particular purpose.

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HEV Generator Software Overview

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Abstract – This paper contains proposals for integration of the artificial intelligence based software into the real-world systems. Study examines some of the problems that can be effectively prevented by implementing relatively simple and inexpensive forecasting systems. One such system, HEV, is analyzed in this work. HEV is highly versatile software package which provides a possibility of generating and training custom structured neural networks. Created artificial neural networks can be used as integrated part of management systems with highly complex dynamic dependencies or as a standalone control/analysis unit.

I. INTRODUCTION

If we start the process of behavioral analysis of any given system, whether we talk about manmade or natural assembly, patterns emerge. With enough structural knowledge about some entity, we can develop mathematical functions that can be used for devising a mathematical model of that same entity. In order to obtain sufficient amount of structural information, extensive research must be conducted. Such researches are often time and resource consuming. There are even cases in which conventional approaches seems to be useless due to the sheer complexity of the problem. As we can see, the need for different problem solving approach arises. When dealing with the research constraining and excessively complex entities, one of the best ways to obtain reliable mathematical model is by using the black box approach. This means that object of interest is observed only as three-component system. These three components are: input, output and transfer function. Working with black box systems relieves us from the need for detailed structure analysis and thus help us avoid above mentioned problems. Since artificial neural networks are one of the best tools for this type of application, they were chosen as the basis for HEV software system.

II. ARTIFICIAL NEURAL NETWORKS

An artificial neural network (ANN) can be defined as a type of an information processing paradigm. Inspired by the biological nervous systems, ANNs are structured in such a way that they can change their inner organization in order to learn. An ANN is composed of a number of simple computation/communication units, called neurons, which are connected by weighted links. Neurons communicate through these links using signals. Every neuron receives a signal as an input and its task is to compute output based on signal's value and weight of the connection which delivered the signal. One neuron can and usually has multiple input signals. The neuron's input value can be calculated as a weighted sum of all separate input signals plus a bias value (1).

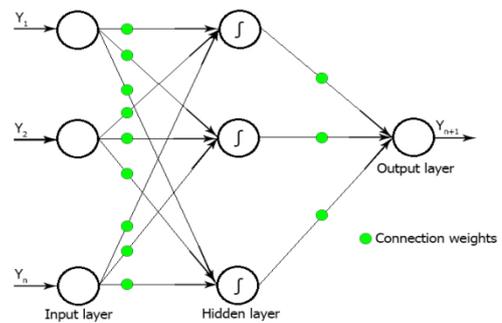


Figure 1. Multilayer perceptron

Neuron's input signal can be other neuron's output or it can be passed from some external source. The nature of neuron's computation properties is determined by the activation function type. The most commonly applied activation function is sigmoid function [2] [3].

There are many different types of ANN structural models, but one that is most commonly used is multilayer perceptron (MLP) shown on figure 1. The main MLP characteristic is the three-layer organization consisting of input layer, one or more hidden layers and output layer. MLPs are usually trained with supervised training methods. During training process neural network is trained for finding the patterns between presented input-output data without the need for any additional information [6].

III. HEV

HEV is .NETFramework application which enables custom building and configuration of MLPs. By using this software, user is able to create mathematical models based on delivered training data. The main idea behind HEV software application is allowing a wider usage and advancement of artificial intelligence software in real systems. During development process of this application, the main emphasis was on overall adaptability in order to ensure maximum compatibility with most modern systems.

After application launch user is presented with Starting screen. First segment from the left is reserved for generating new neural network. User must enter the number of neurons in each layer. This will determine the structure of neural network. In this version of the software the only training method available is backpropagation, the next software version will contain additional training technique in form of resilient propagation. The second segment is reserved for existing neural networks.

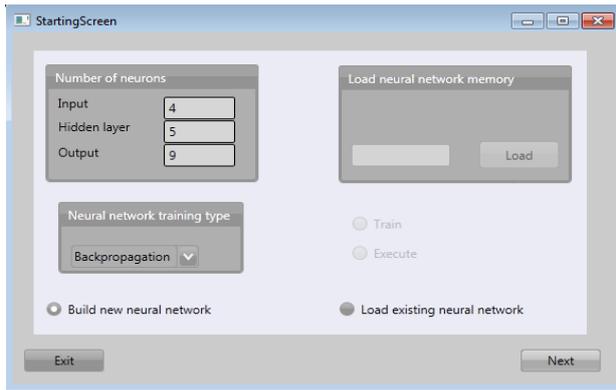


Figure 2. HEV starting screen

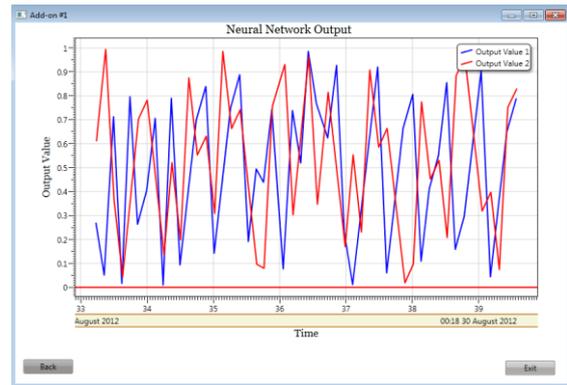


Figure 4. Example of Add-on user interface

After the new neural network configuration data are entered, user can continue to training window by clicking on the “Next” button. In case of loading existing network, loaded memory must contain predefined header with structural information. If user chose to load existing neural network, click on “Next” button will either lead to Training window, if “Train” option is selected or to corresponding Add-on window in case of “Execute” option selection. Figure 2 shows starting screen.

In figure 3 we can see Training window user interface. The upper right corner of the screen contains Parameters setting box. Precision determines stopping condition for training process. When error reaches configured minimum neural network is considered to be trained. Learning momentum effectively keeps a moving average of the gradient descent weight change contributions, and thus smoothes out the overall weight changes. Learning rate determines scale of weight changes during training. If learning rate is set too low, the training will be unnecessarily slow. Having it too large will cause the weight changes to oscillate wildly, and can slow down or even prevent learning altogether.

Located below parameters segment is Training data source box. It allows user to import training data from excel document. Data must be organized in order to be correctly identified by software. Training data should contain system inputs and desired outputs arranged serially. After training completion user can save newly trained ANN’s memory by clicking on a “Save” button in bottom right part of the screen.

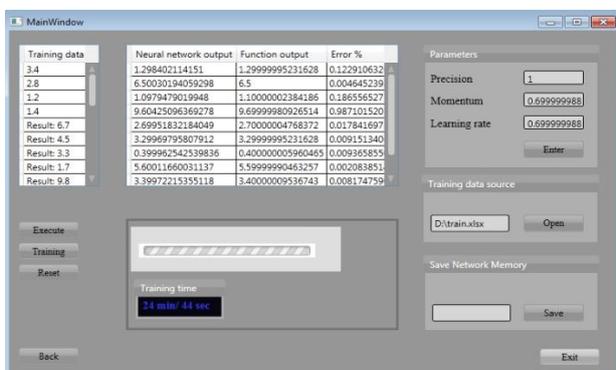


Figure 3. Training window

Figure 4 show an example of add-on user interface. There are two main possibilities for using trained ANNs. By installing adequate add-on, neural network can be used with deployed HEV on any Windows PC platform. The second option is reserved for embedded systems. Memory can be employed by all structurally compatible ANNs even if they use different software platforms.

IV. REAL-WORLD APPLICATION

Forecasting abilities of systems like HEV makes them suitable for solving wide variety of problems. The process of implementation is very simple and does not require highly trained personnel. List of the possible benefactors of this technology contains nearly every aspect of human activity [5] [7].

In the process of designing modern wireless communication systems, procedures for evaluating the level of external noise on receiver have a very important role. Classical approaches based on reading visual graphs that are recommended by ITU can be very time-consuming and error-prone especially during value reading and applying interpolation formulas. Multilayer perceptrons can provide a good alternative to such procedures by modeling complex dependencies based on presented data. ANN-based model can eliminate manual graph reading errors and enable much faster calculations [4].

Industrial systems are prone to improper use of resources due to the lack of optimization. Specialized ANN software can be used as a part of production control system. By monitoring a number of variables, software can regulate resource consumption and thus ensure optimized production process with minimum unnecessary expenses. The key of advanced neural network’s capabilities is their capacity to exploit changing system dynamics in order to forecast an optimal scenario based on previous training [1].

Business is huge field that can be divided into several areas of specialization such as accounting and financial analysis. Almost any scalable and versatile ANN software can be used for financial analysis and prediction. The highest potential for ANN software usage is related to resource allocation, scheduling problems and market forecast. There are many examples of commercially suc-

successful ANN software widely used on the world market such as NeuroShell, Optimal Trader and BrainMaker.

V. CONCLUSION

Given the advantages over the conventional mathematical modeling techniques, ANNs can be seen as the next step in the mathematical modeling software evolution. There is a lot of criticism concerning black box approach and the complexity of the functions used in the neural network approximation processes. This technology is relatively new (ANN rebirth occurred in mid eighties) and there are still many unknowns, but we are getting better and better at understanding concealed principles of ANN functioning every day. Despite the lack of complete understanding, ANNs provided reliable solutions to wide variety of problems and established themselves as trusted and noteworthy software tool. Software such as HEV reveals some of the possibilities of artificial intelligence applications. HEV can be applied in any given system that requires mathematical approximations of complex functions. The most important advantage over similar conventional approximation tools is the fact that there is no need for detailed analysis and problem research. Elementary understanding of underlying principles is enough for building functional and highly reliable mathematical model using only HEV software and available training data. This and similar AI-based software applications are yet to come to their prime in the following years.

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Web Site “Kopaonik – apartmani”

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Abstract - Web site “Kopaonik - apartmani” is designed as a project work from subject IM Information Management. The site is static, which means that the contents cannot be altered from his interface. Web site was designed to be pretty but also to allow users to easily navigate, read and interact. Users can modify certain parameters: background color and font size, the width of the site will be changed depending on the screen resolution.

I. INTRODUCTION

Till 2000, the possessing of own web site was very expensive. Due to the high cost of creating and cost of hosting providers, website was mostly created only for large companies.

Technological development leads to lower prices of hosting packages, also with increasing competition among designers, owning a web presentation becomes much more affordable. But also with increased number of Internet users, small and medium-sized companies prefer to create their own web sites.

Today, the Internet is flooded with various websites. Apart from sites which represent a company, users can find a large number of educational, entertainment and advertising sites.

In the last few years, social network sites received great popularity. Social networks allow users to interact and share different contents, such as images, videos, and various documents, but they also allow sharing users emotion's like being happy, sad or something else.

Generally, the beginning of the 21st century will be remembered as a period of Internet expansion, where Internet use people of all ages, including children and older people.

With increasing number of web sites on the internet we can find many sites which contents are not suitable for all ages and people with special needs. There are many sites with poor navigation and readability.

IM Information Management provides the basis for improving people's life and work. People use the information for their needs: for learning, communication and explaining. The information is "stored" in the computer in the form of bits (zeros and ones), which are translated into words, symbols or pictures which are readable for humans. Most companies engaged in software development still do not consider a design. Users interface for a particular stage in the development of its products, although it is considered significant. They often look at the user interface only as a visual component of the product, instead of looking interface as

a component of the software that will improve communication and achieving goals. On the other hand, many companies employ professional designers who will create their products so that they are recognized in the market, and often the stage of creation is separated from the programming process, it also happens that designing and testing the user interface was done long before the programming of software. It is much more natural that designer starts with design of interface simultaneously with the start of the programming so he can adapt and change interface during development and testing phases of the software.

Successful design user interface includes:

- multidisciplinary development team,
- designers who can successfully mediate between the marketing, management and
- development and fight to adopt good ideas on design,
- Designers who can take care for the design till the end of software development.

II. TECHNOLOGY OF SITE

Web site “Kopaonik - apartmani” is designed as a project work from subject IM Information Management.

The site is static, which means that the contents cannot be altered from its interface. Technology today allows the creation of dynamic websites, where the update is done in the interface of the site, but their production is expensive and requires engagement of designers and developers and needs to be hosted on expensive server that will run the program. For updating static site, administrator needs to have knowledge of HTML and CSS coding.

Web site was designed to be pretty but also to allow users to easily navigate, read and interact. Users can modify certain parameters: background color and font size, the width of the site will be changed depending on the screen resolution.

Site was created using XHTML1.0 (Extensible Hyper Text Markup Language) and CSS 2.1 (Cascading Style Sheets) technology, an animation was done in Adobe Flash, and images were edited in Adobe Photoshop, for some effect and interaction was used Java Script e.g. changing background color. JavaScript is a scripting language that is executed directly on the user's computer, which can reduce the cost of hosting

The site meets the needs of users with different computer configurations and software. Technology is

advancing every day, and software progresses equally. As a result, the web browser is changing, and new technology is implementing constantly.

Therefore it is difficult for designers to match the older and newer technology and allow all users to view a web site comfortably. A website "Kopaonik - apartmani" is optimized for displaying on older operating systems such as Windows 98, XP, etc., and it is displaying excellent on the new operating systems such as Windows 7. If no flash support, the site does not lose shape and readability, but only the attractiveness. Site allows the owner to update or install software automatically if supported. Site is also readable on the most mobile phones, and has potential for further optimization.

To display the site correctly on site was applied standards of writing a XHTML and CSS. XHTML code of site "Kopaonik - apartmani" was verified on site W3C XHTML 1.0. CSS code is verified on site W3C CSS 2.1.

Site "Kopaonik - apartmani" has a page that contains contact form, through it users can directly send message to site administrator's e-mail address. Contact form is written in ASP.NET technology in the programming language C#. ASP.NET is a Web application framework developed and marketed by Microsoft to allow programmers to build dynamic Web sites, Web applications and Web services. For creating page is necessary the basic knowledge of programming, instructions can be easily found on the Internet. Hosting requires Microsoft Server installed. The application itself is not demanding. The form for adding user in the mailing list can be made in similar way. In the case of absence of the Microsoft Server Contact form can be done in other technologies, like PHP (server-side scripting language originally) or the page can be replaced with the static info page.

III. SITE STRUCTURE AND NAVIGATION

The site can be divided into three vertical sections: Header - top of the site with snow flake and setup, Content - the middle part with the main content, Footer - bottom of the site, and in the end the site also has two navigation bars between those three sections.

Header - is identical on all pages. It contains the site name, font adjustment and the background adjustment, on the right side contains links to famous social networks, Facebook and Twitter. All elements are done with certain visual effects in most cases using flash for being more interesting to users.

Below the header is a navigation bar with buttons. Button also indicates what page we are currently on with different button background color, they are also changing color in case of moving cursor over them. When we mouse over some buttons it drops-down menu with another level of navigation. In the right corner there is a button for sending mail. The mail button is grouped together with social networks links.

Content is the central part of the site. On the left there is a sidebar containing additional navigation with e.g. second level navigation, arrow indicates on which page we are currently. Sidebar is also a convenient place for

ads that will reduce maintenance costs. The right part of content is the largest part of web site, there is the main content of page, such as photo gallery, information, and etc.

Below the content there is another navigation bar, but narrower and without the drop down menu.

Footer is a static part of the site; it gives integrity to site and also usually contains some information about the site like owner, technology, hosting company, as well as copyright and privacy policy.

A. XHTML1.0 I CSS2.1

XHTML1.0 is standard of writing code. In html file is defined the structure of web site. Here is defined each part of site with id, name and also file contains a title, paths to images, scripts, and other elements.

CSS is a file that records information about the site and each part. E.g. parameters of size, position, background color, font, frame, margins, etc.

Navigation and dropdown menu are created with the use of CSS code. Advantages of this type of site is that for navigation is not used bulky image animations but only clean code, which speed up the loading speed of web site and also its easier for search spider to recognize and follow navigation links.

B. Java Scripts

Web site "Kopaonik - apartmani" is optimized for greater range of screen resolutions, and so that the width of the site varies depending on the size of the screen or a Web browser that allows better visibility. Mentioned effect is achieved by determining the minimum and maximum with.

Since "Internet Explorer 6" does not support CSS minimum parameter, we correct problem with Java Script "ie6fix.js". Script will be loaded only for the mentioned browsers.

Code for calling java script in index.html

```
<!--[if IE 6]>
  <script type="text/javascript"
src="scripts/ie6fix.js"></script>
  <style type="text/css">
    #nav { float: none;}
  </style>
<![endif]-->
```

File ie6fix.js:

```
window.onload = checkAvailableWidth;
window.onresize = checkAvailableWidth;
function checkAvailableWidth(){
  var iefix = document.getElementById("iefix");
  iefix.style.width =
(document.documentElement.clientWidth < 1024 ?
"988px" : "96%");
}
```

C. Changing the parameters: color and font

For better preview of site users can change the background color and font size.

These capabilities facilitate the work for people with visual impairments. The users have options to increase and decrease the font size by adapting it to their own needs.

When a designer makes web site he should pay attention to the combination of colors that are used for people with disorders of color vision. In this case user can change background color

The changes that the user has committed are remembered on the user's computer in a separate file called a cookie.

For changing parameters and saving settings on the cookie we use Java Script.

In html page we call Java Script:

```
<script src="scripts/style.js"
type="text/javascript"></script>
```

File style.js:

Function for changing font size:

```
var prefsLoaded = false;
var defaultFontSize = '80';
var currentFontSize = defaultFontSize;
var backColor = new Array();
backColor[0] = '#0F61BA';
backColor[1] = '#FFF';
backColor[2] = '#900';
backColor[3] = '#F90';
backColor[4] = '#02418E';

function setFontSize(fontSize){
    var stObj = (document.getElementById) ?
document.getElementById('content_area') :
document.all('content_area');
    document.body.style.fontSize = fontSize + '%';
    createCookie("fontSize",currentFontSize, 365);
}

function changeFontSize(sizeDifference){
    currentFontSize = parseInt(currentFontSize) +
parseInt(sizeDifference * 5);
    if(currentFontSize > 220){
        currentFontSize = 220;}
    else if(currentFontSize < 60){
        currentFontSize = 60;
    }
}
```

```
setFontSize(currentFontSize);
}

function revertStyles() {
    currentFontSize = defaultFontSize;
    changeFontSize(0);
}

Creating cookie and save value for font's size:
function createCookie(name,value,days) {
    if (days) {
        var date = new Date();
date.setTime(date.getTime()+(days*24*60*60*1000));
        var expires = "; expires="+date.toGMTString();
    }
    else expires = "";
    document.cookie = name+"="+value+expires+";
path=/";
}

function readCookie(name){
    var nameEQ = name + "=";
    var ca = document.cookie.split(';');
    for(var i=0;i < ca.length;i++) {
        var c = ca[i];
        while (c.charAt(0)==' ') c = c.substring(1,c.length);
        if (c.indexOf(nameEQ) == 0) return
c.substring(nameEQ.length,c.length);
    }
    return null;
}

window.onload = setUserOptions;
function setUserOptions(){
    if(!prefsLoaded){
        cookie = readCookie("fontSize");
        currentFontSize = cookie ? cookie :
defaultFontSize;
        setFontSize(currentFontSize);
        prefsLoaded = true;
    }
}

window.onunload = saveSettings;
function saveSettings(){
    createCookie("fontSize", currentFontSize, 365);
}
```

Function for color change and loading value from cookie:

```
function changeBG(whichColor){
    document.body.style.backgroundColor =
backColor[whichColor];
    document.getElementById('header-
left').style.backgroundColor = backColor[whichColor];
    document.getElementById('header-
right').style.backgroundColor = backColor[whichColor];
    document.getElementById('footer-
left').style.backgroundColor = backColor[whichColor];
    document.getElementById('footer-
right').style.backgroundColor = backColor[whichColor];
    createCookie("backColor", whichColor, 365);
}
if(readCookie('backColor'))
    document.write('<style type="text/css">body,
#header-left, #header-right, #footer-left, #footer-right
{background-color: ' +
backColor[readCookie("backColor")] + '}</style>')
else
    document.write('<style type="text/css">body,
#header-left, #header-right, #footer-left, #footer-right
{background-color:#02418E;}</style>');
```

D. Pop-up image box

When user clicks on image, image pops-up, size is also increased, it is more practice then opening in a new page. The advantage of this is a nice visual experience where user does not need to press back button on the browser and awaits reloading of previous page, that mean that user stay on current page, and if it is more image on page user can list it with button next and previous.

For creating this effect Java Script is also used. On the Internet, we can find a number of ready-made solutions, free and commercial. For this effect on site “Kopaonik - apartmani” we use two free scripts: JQuery and Slimbox2. JQuery is a fast and concise Java Script Library that simplifies HTML document traversing, event handling, animating, and Ajax interactions for rapid web development. JQuery is designed to change the way that designers write JavaScript.

Slimbox2 is Java Script for Jquery, author is Christophe Beyls. I chose slimbox2.js because it's free and also because his tiny dimensions. In file slimbox2.js blank space is delighted for getting the smallest size possible for JQuery script I chose 1.3.2 version, it is the smallest version compatible with Slimbox 2. File jquery.min.js is compressed and it is hosted on Google script sharing server with compression support. Compression also speeds page load time.

E. Flash

On site we have three flash files: header.swf, footer.swf and desni-footer.swf.

In header.swf we have three parts. The first is title with snow flake. We made one snow flake and then we program it with action script.

F. Instructions for creating snow animation

Using the Oval Tool create a small white circle (4.0 pixels in diameter), press (F8) and convert it to a MovieClip.

Give it an instance name of "snow", and place the Clip at the top left of the stage.

Insert a new layer and name its actions. Click on the frame and select Actions, insert the following code:

```
for (k=0; k<50; k++) {
duplicateMovieClip(_root.snow, "snow"+k, k);
}
```

Now Right Click on the Snow MovieClip and select Actions from the menu. Type in the following code:

```
onClipEvent (load) {
    movieWidth = 300;
    movieHeight = 200;
    i = 1+Math.random()*2;
    k = -Math.PI+Math.random()*Math.PI;
    this._xscale =
this._yscale=50+Math.random()*100;
    this._alpha = 75+Math.random()*100;
    this._x = -10+Math.random()*movieWidth;
    this._y = -10+Math.random()*movieHeight;
}
onClipEvent (enterFrame) {
    rad += (k/180)*Math.PI;
    this._x -= Math.cos(rad);
    this._y += i;
    if (this._y>=movieHeight) {
        this._y = -5;
    }
    if ((this._x>=movieWidth) || (this._x<=0)) {
        this._x = -
10+Math.random()*movieWidth;
        this._y = -5;
    }
}
```

Change the values for movie width and movie height from 300 x 200 pixels to the width and height of your current movie.

Change the number "k<50" from 50 to some other number - present the number of snowflakes you want on the screen.

G. Instructions for creating menu for changing font size

Create a new Flash document and for demonstration purposes set the dimensions to 300 x 200 pixels with 30 frames per seconds.

We need two layers: Menu and Script.

On the Menu layer, draw yourself a small box using the rectangle tool (R), and make it about 30 x 30 pixels. Select this box and press (F8), select Movieclip from the menu that appears and name it menuMC. Make sure that you set the registration point to the left. Click OK.

Position the Movie clip so that it sits nice and snug to the left of the stage (Figure 1).

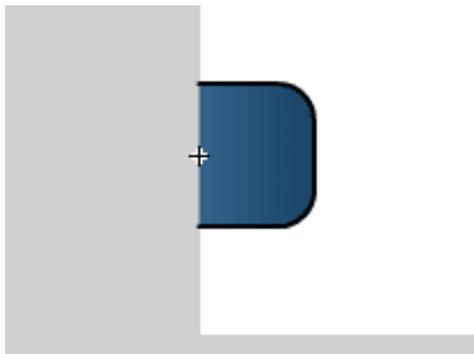


Figure 1. Small box

Give the Movieclip an instance name of dragger.

Right-click on the Movieclip and choose Edit in Place from the menu that appears.

Name the default layer tag, and then insert four layers above the tag layer: hit on area, hit out area, script and labels. And then add a layer underneath the tag layer called white base. In all you need to have six layers.

Make the tag layer and the white base layer 22 frames long.

On the white base layer, select frame 2 and press (F6) to add a keyframe.

On frame 2 of the white base layer, draw a white rectangle 195 x 28 pixel using the rectangle tool (R).



Figure 2. White rectangle

Position the white rectangle as shown on Figure 2.

Right-click on the white base timeline and choose Create Motion Tween.

Add key frames at frames: 7, 12, 13, 14, and 22.

Select the white rectangle at frame 2 and in the properties panel at the bottom of the screen, change its width to 1.

Then select the rectangle at frame 7 and again in the properties panel change its width to 205 pixels. On frame: 12, 13, and 14 its width needs to be left at 195 pixels.

Then on the final keyframe 22, change the rectangles width value to 1.

Moving on, go to the hit on area layer and make sure that the timeline is only 1 keyframe long.

Using the rectangle tool (R) draw a rectangle 190 x 20 pixels and convert it into a button. Set up the hit state only on the button.

Go to the hit out area layer, and select frame 13 on the timeline. Press (F6) to add a keyframe.

Using the rectangle tool, draw a large hit area around the stage. Once you have created something similar to Figure 3, then convert it into a button and set the hit state only.



Figure 3. Hit out area

Once you have created the hit out area button we can add the stop actions and labels.

So on the script layer add key frames at frame: 2, 13 and 14.

On frame 1 of the script layer, press (F9) to open the actions panel and add a "stop();" action. Do the same for frame 13.

Go to the labels layer, and add keyframes at frames 2 and 14.

Select frame 2 on the labels layer and in the properties panel at the bottom of the screen, type in a frame label of on. Select frame 14 and add a frame label of off.

The last thing to do inside the menu Movieclip is to add some script to the buttons we created. So on the hit on area layer, select the button that is on frame 1 and add the following code into the actions panel:

```
on (rollOver) {
gotoAndPlay("on");
}
```

Then select the button on the hit out area layer and add the following code to the button:

```
on (rollOver) {
gotoAndPlay("off");
}
```

That's the menu done. We will add buttons, text and other elements into the menu later.

Ok, with the menu done, we can add the two scripts that make things work.

Click back to the main stage and select the menu MC movie clip on the stage. Press (F9) to open the action panel and add the following code:

```
onClipEvent (load) {
    _y = 0;
    speed = 20;
}
onClipEvent (enterFrame) {
    endY = _root._ymouse;
    _y += (endY-_y)/speed;
}
```

The above script is for the movement of the menu MC. The script allows the MC to move along the Y axis at a speed we specify at 20. You can change this number to effect the speed, the higher the speed the slower it goes, and the lower the number the faster it becomes.

Select the empty frame on the script layer and add the following code:

```
dragger.onEnterFrame = function() {
    this._y += this.ySpeed;
    var bounds = this.getBounds(_root);
    if (bounds.yMax>200) {
        this._y = 200-this._height/2;
    } else if (bounds.yMin<0) {
        this._y = this._height/2;
    }
}
```

This script sets up a boundary for the instance of dragger (menu MC). In the script there are two instances of 200 pixels. This is the total height of the stage, or the total height of the boundary you want to set. You can also change these two sets of numbers to correspond to your stage height.

The third is part with four buttons with hit-on effect.

Footer.swf contain vector graphic element, those elements provides good quality and small size. Buttons are animated.

desni-footer.swf – vector graphic with few buttons

H. Image

Because of the difference in internet speed all the people cannot equally enjoy its benefits, on the website “Kopaonik - apartmani” all images are optimized in Adobe Photoshop as well as all graphic elements. Images that contain a small number of colors are captured in GIF (Graphics Interchange Format) or PNG (Portable Network Graphics) format for smaller size.

An interesting image is “footer.gif” with only 10 pixels with, using repetition effects on x-axis in the CSS file, image gets the effect of the bigger with and it is also scalable, we used it to connect the left and right part of header so page does not lose shape on changing size. Similar effect is also used with image “content_bg.png”.

Image “face-tweet.png” contains four images for decreasing http (Hypertext Transfer Protocol) request and faster loading.

IV. CONCLUSION

Technology advances every day, internet speeds are increasing and prices of hosting are becoming more accessible which contributes greatly to the quality of web surfing, but we should not forget that the site optimization is one of the key factors for success.

Size of one page on site “Kopaonik - apartmani” with all design elements and scripts is only 68 kilobyte, which is far less than most modern sites, while on the other hand it does not skimp on design and functionality. Perhaps the designers were relaxed and sites are turning out stereotypic.

Due to the rapid progress of technology, designers need to improve sites constantly and adapt them to greater extent of customers and their needs. But now at this moment new technologies appeared and new standards are creating. New standard, HTML5 is here, but we need to find an alternative for users in transition.

Site “Kopaonik - Apartmani” is not fully functional locally, for full working version of site check web address: www.kopaonik.titleget.tk

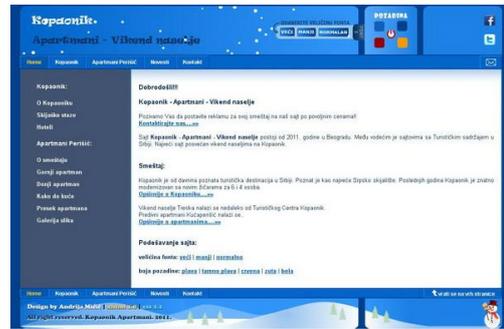


Figure 4. Website “Kopaonik – apartmani”

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Best and Worst Business Intelligence Practices

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Abstract – Business Intelligence is a discipline which is made up of several related activities. Those activities include data mining, reporting, querying and analytical processing. Business Intelligence represents the tools and systems which are significant in the strategic planning process in corporation. These systems will correspond on demands of customers. Companies use BI to communicate with customers, in areas of customer support, market research and statistical analysis. It's very important for companies to understand the factors that influence BI and learn how to build and implement an effective BI strategy.

Most companies collect a large amount of data from their business operations. They will need to use many software programs, such as Excel or Access to follow and analyze that information. BI provides multichannel analytical solutions and gain rapid and deep business insights across all customer demands.

I. INTRODUCTION

The term Business Intelligence represents the tools that have a key role in the strategic planning process of the corporation. These tools allow a company to gather access and analyze data in decision making process. BI strategy should include a broad set of technologies, and stakeholders for collecting and accessing information for the purpose of helping organization make better business decisions.

Most companies collect a large amount of data from business operations, and because of that they need to use a wide range of software programs. They usually use Excel, Access and different database applications. Although traditional business intelligence systems were delivered via host terminals or paper reports, the typical modern deployment of a BI application is over the web. It is possible to develop interactive BI applications optimized for mobile devices, smart phones and e-mail.

With the help of BI systems, employees modify their individual and team work practices. Effective BI strategy should ensure that enterprise objectives, business strategy and BI are aligned. Enterprises that are able to connect BI to overall business objectives become intelligent enterprises.

II. BENEFITS OF BUSINESS INTELLIGENCE EFFORTS

Wide range of applications for BI has helped companies to identify cost-cutting ideas, uncover business opportunities and optimize prices. BI software can give companies more advantages during negotiation by

making it easier to quantify the value of relationships with customers.

There are many of opportunities to save money by optimizing business processes and focusing decisions.

For example, employees of the city of Albuquerque used BI software to identify opportunities to cut cell phone usage, overtime and other operating expenses, saving the city \$2 million during three years. Likewise, with the help of BI tools, Toyota realized it had been double-paying its shippers to the tune of \$812,000 in 2000¹. Companies that use business processes are in much better position than companies that use BI to monitor what's happening.

III. THE MOST IMPORTANT COMPONENTS OF THE BI STRATEGY

As a primary component of business intelligence can be given:

1. Business context

BI strategy should be concerned how it will help enterprise business objectives, how will it enable better decision making to provide better quality of business. The company should have in mind that a successful business intelligence strategy aligns with business goals.

Some examples of business objectives that should be addressed by BI strategy include how to increase customer loyalty, increase the number of customers, increase market share, plan product promotions, decide product and service bundles, analyze customer demographics to align business goals, determine customer profitability patterns etc.

2. Key Performance Indicators (KPIs)

KPIs are used to evaluate the state of business. KPIs help the enterprise in measuring the progress. It should be designed to measure the performance against the targets. They are mechanisms that help the company to reach the desired goal. KPIs include vital statistical information, such as sales trends, profit values, customer satisfaction measurements, relative departmental performances, real-time inventory statistics, or anything that is deemed critical for the success of the enterprise. It's an integral part of BI strategy, as they contribute to commission the business strategy.

Without the use of KPIs, it will take significant time and effort to collect and process the data to get the overall performance information causing further delay in addressing the business issues. BI uses KPIs to gauge the current state of the business and relate it to the organization and help business come up with a course of action to get the target state of business.

3. Typical BI architecture

BI architecture has some common components, which are found in some shape in all BI solutions.

The diagram shows the overall BI architecture. Wide ranges of BI architecture are: different sources of data, integration services, reporting, delivery and consumption.

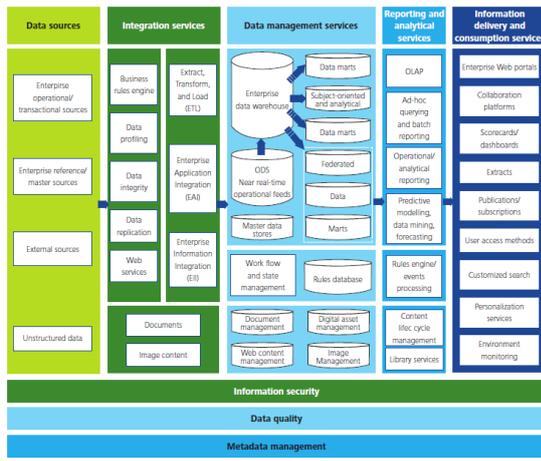


Fig1: Typical BI architecture

data in order to satisfy business needs. Governance plays a fundamental role in BI strategy. When crafting the BI Data management promotes an understanding of the business and technical perspective with the aim to use the strategy, you should take into account the fact that instituting a data governance program along with master data management initiative will provide enterprise with a central focus for identifying and controlling the collection, storage and disposition of information resources. It is very important that data governance is an essential part of successful BI strategy as it improves information quality and confidence in decision making, lower the costs of managing the data, designates accountability for data quality, and makes the best use of the data to achieve the overall enterprise objectives.

4. Data quality

A recent Gartner BI survey of more than 600 BI users found that more than 35% of users identified data quality as one of the top three BI problems facing their organization in the second biggest challenge overall². Data quality often dictates the success of a BI project. Poor data quality leads users to abandon the system and creates considerable rework in deploying the BI solution. By strategy should emphasize the quality of data, and it

² Gartner, 'Gartner Says Organizations Must Establish Data Stewardship Roles to Improve Data Quality', January 2008.

will be continues through all the processes in the company.

Data quality should be a joint effort by business and IT to ensure the success of initiative. IT makes it possible to use technology in manage data simple way. Good quality data enables employees to make favorable decisions at the company.

5. BI platforms and tools selection

Larger parts of the budget of IT are being spent on improving of BI because of its importance. Increase in spending is due to urgent requirement to deliver consistent, accurate, and trusted information to all stakeholders to meet the business goals.

The existence of multiple sources of data and system complicate BI environment. The selection process should take consideration the existing infrastructure of the company and to enable the best use of existing resources. The idea is not to BI be observed in terms of the latest features, but to provide a common environment that will allow all users to move towards common business goals.

6. Data governance

Data governance provides for an enterprise- wide data governance body, a policy, a set of processes, standards, and an execution plan for managing the data. It promotes data quality, integrity, security, and thus increases the information usability and reliability. It provides a consistent and methodical approach to the process of data management in the enterprise.

7. End-user information delivery

BI strategy should emphasize the integration of knowledge in the general management of the company. Some components of end-user delivery are: standard reporting, ad-hoc analysis, notifications, OLAP cubes and forecasting technologies. The goal is to provide users with information that is action-oriented and analysis environment.

BI should be integrated with business operations to associate the results of BI with business activities. In that sense, BI should attempt to be both process centric and data centric. This involves integrating performance improvement and process management technologies. Core of BI system are the data, such as operational information that come from stores, warehouse information etc.

BI is integrated with the business environment to achieve the border business goal, traditional architecture must evolve to provide for a collaborative environment of the user- friendly technologies to enable better decision making along with process and performance improvement.

IV. BI FRAMEWORK

BI framework brings together the forces that drive business operations: people, processes, and technology in

a collaborative environment. Frameworks should order to develop in the direction of setting goals, business context, strategy and success criteria. The framework improving the integration with business planning systems supports knowledge management, business processes, technologies and users.

BI framework consolidates data governance, data architecture, technical architecture, data quality, data integration, end-user information delivery and data security to empower the BI initiatives. It should set standards that all participants must adhere to. It also

provides means to connect significant components that are part of overall BI vision.

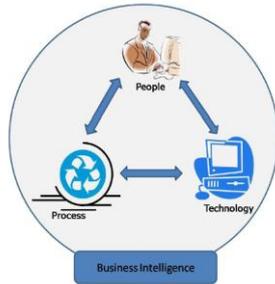


Fig2:BI frameworks

V. THINK BIG, START SMALL

It is proved that the iterative approach would work better than access scheduling. Iteration for access to specific operating condition must be well-defined. Authors should try to develop a vision for the project that could be built gradually, in increments. The approach to implementing BI should be flexible, so that the project can be successful and effective.

You should be within the BI strategy is the ability to perform multiple steps simultaneously where more activities can occur at the same time. Good think is to follow a parallel development and access to various aspects of BI, such as information management, data integration and analysis of influence.

VI. PROVEN PRACTICES

There are some proven practices that have been accepted in BI area. These can serve as guidelines in terms of things to do for ensuring success of the BI initiative. Steps for ensuring advance in BI strategy are:

- Create a business case and outline the expected benefits;
- Have an enterprise-wide perspective;
- Obtain buy in from stakeholders, especially the senior executives;
- Establish criteria for success;
- Treat information as an asset;
- Adopt best practice and standards;
- Set up change management procedures;
- BI strategy should be aligned with IT strategy and enterprise aims;
- Gap analysis and future state are required;
- Establish governance body;

- Work with frameworks and adopt proven methodologies;
- Identifying of related gaps and issues;
- Analyzing of assumptions and constraints;
- Considering of all BI components.

VII. WORST BI PRACTICES

❖ Worst practice #1: Allowing Excel to become the default BI platform

Excel is the most used BI tool in the world. In case at the company does not exist BI applications, Excel is used like that. The advantage of Excel is that it provide very simple interface which is serviceable for commonly functions like calculating, presenting and displaying numerical data. It is a standard utility tool given to practically every information worker the day they start their first job.

Even though Excel has many advantages, it adversely affects at the quality and consistency of information. This is especially damaging in heavily controlled industries that must adhere to strict compliance legislation. It is assumed that 7% of all data found in Excel spreadsheets is wrong. The results of those errors have cost companies millions of dollars.

It can be done, as solution to minimize the manual work done in Excel, and preventing the accumulation of critical data in personal spreadsheets. One way for this solution is to at Excel in BI viewer. Under the assumption that is true, precalculated data is fed into Excel applications, the user has little or no work to do to get the results. Data can live in regulated and secure source, such as in the data warehouse or operational system. There are solutions, like WebFOCUS which can make Excel more secure and less error prone, which still allowing users to work in their preferred environment. WebFOCUS is information builder and it offer two options that help with problem about Excel:

- ❖ Automatic generation of reports in Excel format;
- ❖ Automatic update of Excel spreadsheet and applications, regulated data from any connected data source.

Any of these two options limit the amount of manual work performed in Excel, decrease data errors, and reduce the accumulation of personal spreadmarts.

❖ Worst practice #2: Selecting a BI tool without a specific business need

Company recognizes the need for business analysis and because of that plan a project to evaluate and purchase BI solution for users. BI rarely has impact on business, without specific need. Moment for creating BI solution should be when particular project or task exists. When information requirements such as these are identified up front and used as the business driver behind of the BI implementation of the BI system has more likelihood for success. It is very important to know beforehand what

can be expected if information is injected into the process.

VIII. TURN FAILURE INTO SUCCESS

BI software response to the need for accurate and timely information to supporting informed business decision. There are tools for report design, such as ad hoc query and online analytical processing (OLAP). BI combines these tools with databases and portal to deliver BI applications.

BI software has a significant potential for helping companies to make business decision and achieve their business goals.

The worst practices set companies on the way of failure. These worst practices are result of wanting to follow latest technologies without balancing with practical knowledge and experience.

IX. BUSINESS INTELIGENCE ANALYSIS

Customers usually have an increasing number of choices for how they communicate with business- call center, ATM, website etc. They exchange information across these channels and it helps marketers to understanding customer behavior. Multichannel analytics solutions provide business intelligence software analysis. It has ability to gain deep business insights across all customer touch points, and:

- ❖ Customer interactions can correlate across digital and traditional channels;
- ❖ Decisions are based on rapid discovery of billions of records.

X. ORACLE BUSINESS INTELLIGENCE

Oracle Business Intelligence 11g is a BI platform which delivers all capabilities. That includes interactive dashboards, notifications, financial and other enterprise reports, presentations and analysis, mobile, integrated system management and much more capabilities. OBI 11g is based on Web services which are oriented on architecture which interacts with an organization's infrastructure of information technology. The aim of such interaction is to lower costs of ownership and highest return of investment. OBI 11g enables fully insight for all employees in an organization. This leads to better results in process of making decisions and more-efficient business processes.

Oracle Business Intelligence integrates with any business application, data source, security infrastructure and application server.

OBI 11g is based on open and service oriented architecture. The suite features a common enterprise information model, configuration deployment and system management framework.

Oracle BI on Cloud

Cloud based systems are characterized by performance like on-demand self-service, resource binding and broad network access. Cloud computing is significant part of technologies that is developing in Oracle.

Business Intelligence systems are very important for Oracle. Integrated analytical view has had a material impact on how the Oracle BI platform has been integrated and why BI of Oracle is easy to deploy on the cloud. Some of choices for cloud deployments are: common enterprise information model, Oracle BI server, Oracle BI presentation service, and metadata driven architecture, standards based open system, etc.

Deployment examples

➤ Oracle CRM on Demand

Oracle CRM on Demand offer the most universal CRM solution by delivering fully interactive analytical possibilities that allow user to gain deep insight into their business. Business Intelligence combine real-time and ad hoc reports. Oracle CRM on Demand makes actionable, up-to-the-moment business intelligence which is available to employees on all levels. With only one click users can drill down into data to have more information about business of company.

Oracle CRM on Demand has integrated use of Oracle BI platform and it's supporting by cloud based delivery model.

➤ Xactly Corporation

Xactly is using Oracle BI to deploy an analytical solution which helps customers track and analyze what they have sold, through which channels, and at what discount. More than 125 companies in the world use Xactly's solution every day. Oracle BI helps Xactly deliver advanced reporting capabilities as dashboard creation tools. That helps end users to gain value match more quickly.

expect their requirements to be met. It usually starts with policy statement, general guidelines, and high level diagrams. BI strategy should be a part of the enterprise vision. Consider the current BI trends and also the coming wave of forward looking approaches for building the successful BI strategy.

XI. CONCLUSIONS

BI strategy should be designed to be adaptive. It must focus on communication between company and customer. Company has to answer on some questions, such as what are you planning to do and when users can expect their requirements to be met. It usually starts with policy statement, general guidelines, and high level diagrams. BI strategy should be a part of the enterprise vision. Consider the current BI trends and also the coming wave of forward looking approaches for building the successful BI strategy.

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Customer Relationship Management Software Solutions – Comparative Analysis

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Abstract - In this paper, through a comparative review, some of the best-selling Customer Relationship Management (CRM) software were analyzed. The main reason is because only few researches have been conducted on the topic of comparative analysis of the most commonly used CRM software. This paper is intended to be used as a guide to help end-users in their vendor selection process. In order to enable end-users to identify which CRM software best meet their specific business requirements, they are categorized by modules, features and other criteria.

Key words: CRM Software, comparative analysis, CRM modules.

I. INTRODUCTION

For businesses of all sizes, acquiring, retaining, and supporting customers is more challenging than ever before. An important element, especially in the sphere of organizational processes in customer oriented organizations is the CRM [1]. By using information and communication technology, companies are trying to get closer to the customer so that they can create long-term relationship [2].

CRM significantly improves a company's internal organization in interaction with its customers and distributors, by establishing efficient communication mechanisms and accelerating the implementation of daily operative needs. In other words, the customer relationship management is organized in such a way that the needs, the demands and the expectations of customers are not only fulfilled, but also surpassed.

The CRM software represents an efficient way of business processes by which a company manages its contacts and the information about their customers, distributors, their respective needs and all the relevant information about market accesses.

The main goal of this paper is to be used as a guide to help end-users in their vendor selection process.

II. CRM SOFTWARE IN ENTERPRISES

Innovative businesses seeking to take control of the total sales cycle through innovative interactions and value-driven platforms will leverage customer relationship management (CRM) solutions. For the growing business, there are five key attributes to demand in CRM software, including scalability and flexibility, an

intuitive user experience, dashboard reporting, the potential in hosted solutions, and an understanding of the business requirements.

Scalability and Flexibility should be a key focus for any growing business. The selected CRM solution must be able to change along with the needs of the business, growing along with the business itself and the associated activities to support that growth. The market can rapidly change, demanding more from the CRM platform at any given time. The software application and the supporting hardware or hosting solution should provide optimal performance in times of growth and in times of stagnant performance.

Intuitive User Experience or Usability - Anything introduced into the sales' reps workflow is bound to be met with resistance, no matter how much benefit is promised. This is especially true when the new platform or tools required extensive training. Sales reps view anything added to their day as time away from their core competencies. If they understand the benefits the platform was designed to provide and can immediately start to use it with ease, the organization immediately benefits. An intuitive interface is one that is best catered to the specific user. Features may include one-click dialing from a customer's contact information, account management for the individual rep, calendar personalized to the rep, but also viewable by others, opportunity management, lead scoring, lead nurturing and activity management capabilities that are easy to find, schedule and integrate into other related activities.

Dashboard reporting for Management - CRM solutions that provide for a dashboard view of all reports makes information easily accessible for management, while providing a great incentive point for reps who can measure their performance against others in the company. Custom reporting is essential for all businesses leveraging CRM platforms as it is critical to capture that information that truly drives successful sales activities and identifies potential opportunities.

Consider hosted CRM software - The hosted delivery model enables the organization to access a CRM application hosted on the provider's servers for a set subscription fee. This delivery model significantly reduces the initial costs of implementing the CRM solution, while also eliminating some of the barriers to entry for the smaller business. The application runs in the

cloud, accessible through a Web browser. Information is captured into a database, also hosted on the provider's server, yet managed by the company subscribing to the service. Little to no IT infrastructure is needed to access these applications, and the scalability and flexibility of the solution allows the company to easily add users and make adjustments to features to support future growth.

III. CRITERIA FOR PICKING A CRM SYSTEM FOR BUSINESS NEEDS

Which CRM system is right for an organization can depend on several factors, and it isn't a decision organizations can afford to take lightly. CRM is the path to customer loyalty, new business and increased revenues over the short and long-term, affecting every area of an organization's success. Value-added services can also be enhanced with CRM systems to establish stronger market presence.

Part of the CRM decision is determining which type of CRM system meets an organization's needs; organizations must evaluate whether a vertical, or a more general solution, will give them the best CRM outcomes. Increasing numbers of CRM solution vendors are streamlining their mainstream CRM tools to seem more industry-specific; and likewise, industry-specific CRM vendors are striving to appeal to a broader range of industries, so the decision is becoming more complicated.

When considering *vertical versus a general CRM solution*, businesses should contemplate whether or not a vertical solution exists that truly meets their needs. This is what vertical solutions are designed to do, but not all can fully meet this functionality. While vertical CRM solutions may take longer to implement than more mainstream models, they can provide deeper levels of customizability. For example, features available in vertical CRM formats, like very specific requirements definition capabilities and code testing may not be available in a general CRM format. If an organization chooses a mainstream CRM solution when they need a vertical solution, they can find themselves engaging in layer after layer of testing before completing the evaluation process.

Company size is a key factor - In terms of scalability, organizations will maximize their opportunities for growth and meet their mission more effectively when a CRM solution matches their company size and plans for growth. Specifically, CRM systems must be ready to provide increases in performance during customer-heavy periods, like holiday seasons for retailers, and must be equipped to prevent lost resources during slower periods. CRM software should also allow customer agents to rapidly find customer records – even if this data comes from varying-sized batches of customer records.

A number of different industries suggest the “try before you buy” approach to products and this is an important step with CRM. A vendor will promise all the bells and whistles necessary and ensure deep and seamless integration as that is what they are trained to guarantee. If the person making the CRM selection is not versed in IT integration, the right questions may not be asked and the resulting implementation could be a

disaster. Whether the company elects to implement hosted or on-premise solutions, most vendors can accommodate the try it first approaches. The cloud-based solution should be accessible through the Web browser and the full suite should be made available. If all applications, functions and features cannot be tried before the contract is signed, it is wise to look for another vendor.

IV. COMPARATIVE ANALYSIS

The CRM market is currently experiencing rapid growth; analysts expect the global CRM market revenue to hit around at least \$18 billion in 2012. CRM growth was driven by strong demand for marketing automation, sales automation and customer-service technologies [3]. There are many CRM vendors now and it is very important to choose the right one. Which CRM system is right for an organization can depend on several factors, and it isn't a decision organizations can afford to take lightly. These factors are:

- Industry Specific CRM or Mainstream Solutions;
- Company size;
- On Premise CRM or Hosted CRM;
- Software features (modules);
- Ease of use/implementation;
- Vendor evaluation [4].

According to [3] and [5] some of the best-selling CRM software are: Oracle, SAP, Salesforce.com and Microsoft Dynamics. A comparative analysis in this paper is done based on these results.

Microsoft Dynamics for customer relationship management empowers employees to boost sales, satisfaction, and service with automated CRM that's easy to use, customize, and maintain. Microsoft Dynamics business software offers a wide spectrum of affordable CRM solutions to help companies meet their specific needs. Microsoft CRM is unique in an increasingly crowded CRM software market to use the same code base for on-premise and Software-as-a-Service (SaaS) delivery models. It's also unique in its ability to support multiple public clouds for SaaS delivery.

The company's most recent release also allows cloud customers and business partners to install server-side code in the Microsoft cloud and data centers. This permits extensibility for a number of business processes not supported by most competitors.

The *Oracle CRM* includes: Oracle Siebel CRM, Oracle CRM On Demand, Oracle E-Business Suite, PeopleSoft Enterprise CRM and JD Edwards EnterpriseOne CRM. Oracle CRM has a reputation for high risk, and expensive deployments. In fact, failed implementations and frustrated users are the primary impetus for the rise and sky-rocketing growth of Cloud or SaaS CRM systems.

The company's hosted software, Oracle CRM On Demand, competes with Salesforce.com. CRM On

Demand offers low-cost, hosted CRM solution with little or no up-front IT investment. With CRM On Demand, companies can accelerate sales, improve marketing and deliver consistently top-notch customer service.

Salesforce.com is relatively new vendor. *Salesforce.com* provides an array of CRM and business application services which enable customers and subscribers to systematically record, store, and act upon business data; and to help businesses manage customer accounts, track sales leads, evaluate marketing campaigns, and provide post sales services. This vendor, also known as a cloud CRM pioneer, is now the third largest CRM software company in terms of market share.

Salesforce.com has become a leading provider of customer relationship management software applications deployed using the SaaS or Cloud computing model. *Salesforce.com* doesn't support On-Premise CRM.

The *SAP CRM* software solution is a fully integrated CRM software that targets business software requirements of midsize and enterprise organizations across industries and market sectors. Similar to top competitor Oracle, SAP has more recently released two SaaS CRM products—SAP Sales on Demand which is a cloud CRM extension for the company's on-premise ERP software and SAP Business By Design which is a full ERP cloud suite that includes CRM.

SAP offers CRM on-demand solutions that are easy-to-use, Web-based, and available on a subscription basis.

The following **table I.** shows some of the basic advantages and disadvantages of CRM software [6].

TABLE I. CRM PRODUCT PROPERTIES

CRM Product	Advantages	Disadvantages
MS Dynamics CRM	<ul style="list-style-type: none"> - Good integration with Microsoft Office products - Reasonable sales force automation (SFA) - Strong technology foundation and architecture - Strong partner delivery network 	<ul style="list-style-type: none"> - Heavy browser architecture -fat client - Weak marketing and customer base - Limited to small business organizations
Oracle CRM	<ul style="list-style-type: none"> - Integrates to Oracle Financials - Nice dashboard - Good data warehousing (lacks flexibility, but good presentation) - Strong sales force automation (SFA) 	<ul style="list-style-type: none"> - Not as strong marketing automation or customer service - Lacks deep functionality offered by some other hosted vendors - Offline version is pretty bad - Allegedly poor customer service and turnover
Salesforce.com	<ul style="list-style-type: none"> - Purely on-demand CRM solution with highest installed base - Built a strong ecosystem around the core product - Apex may be a future boon for Salesforce 	<ul style="list-style-type: none"> - Recurring downtime and service interruptions combined with lack of SLA (service level agreement) scare many - High-use of third party products as a crutch against low functionality

		<ul style="list-style-type: none"> - Ridiculous rules around usage limits make management very tough - Questionable customer support
SAP CRM	<ul style="list-style-type: none"> - Backing by the largest application software vendor in the world - Isolated tenancy hosted delivery model is a welcome change from most other hosted CRM vendors - Strong ERP can be leveraged into the CRM 	<ul style="list-style-type: none"> - The product is new, shallow and comparatively weak when compared to other hosted CRM vendors

The working area of CRM vendors is wide and varied. Some vendors are focused on the entire enterprise solution, while others have specific functional specialties such as Marketing Automation or Customer Service. In **table II.** CRM vendors are categorized by different criteria and presented in a matrix.

TABLE II. MATRIX OF CRM CRITERIA

Criteria	Vendor			
	Microsoft Corporation	Oracle	Salesforce.com	SAP
Suite	x	x	x	x
Marketing	x	x	x	x
Customer Service	x	x	x	x
Call Center	x	x	x	x
Sales Force Automation	x	x	x	x
Hosted/SaaS	x	x	x	x
On-Premise	x	x		x
Enterprise	x	x	x	x
Mid-Size	x	x	x	x
Small	x	x	x	

As can be seen from the matrix Microsoft Dynamics and Oracle covers all area, while *Salesforce.com* doesn't support On-Premise CRM. On the other hand SAP is more focused on mid-size and big enterprises and doesn't have CRM software solution for small enterprises.

Each CRM software is consist of certain modules or features. The structure of the CRM software is usually consists of the following group of modules:

- *Customer Service*
- *Sales*
- *Marketing.*

Beside of these basic modules CRM software also contain other modules. In almost all CRM software there are differences in the names of certain modules, respectively modules can have exactly the same functionality but different names, or with the same name, but with completely different functions. **Table III** shows a comparative review of the basic characteristics and modules of these software solutions [7], [8], [9] and [10].

TABLE III. COMPARATIVE REVIEW OF BASIC CRM CHARACTERISTIC

Vendor	Microsoft Corporation	Oracle	Salesforce.com	SAP
Product	Microsoft Dynamics CRM	<ul style="list-style-type: none"> • Oracle CRM On Demand • Siebel CRM • Oracle E-Business Suite CRM • PeopleSoft Enterprise CRM • JD Edwards EnterpriseOne CRM 	<ul style="list-style-type: none"> • Contact Manager Edition • Group Edition • Enterprise Edition • Professional Edition • Unlimited Edition 	<ul style="list-style-type: none"> • SAP CRM • SAP Business All-in-One • SAP Business by Design • SAP Business One
Modules	<ul style="list-style-type: none"> • Customer Service • Sales • Marketing • Go Mobile 	<ul style="list-style-type: none"> • Sales force Automation • Partner Relationship Management • Marketing Automation • Customer Service and Support • Content Management <ul style="list-style-type: none"> • Innovation Management • Real Time and Historical Analytics • Desk Top and Mobile CRM <ul style="list-style-type: none"> • Data Model Customization • User Interface Customization • Enterprise Administration 	<ul style="list-style-type: none"> • Marketing • Sales • Contracts • Service • Channels • Foundation Components 	<ul style="list-style-type: none"> • Marketing • Sales • Service • Partner Channel Management • Interaction Centre • Web Channel • Business Communications Management • Real-time Offer Management • Trade Promotion Management
Price in \$	440 - 880 per user and 528 - 1 761 per server	<ul style="list-style-type: none"> • Oracle CRM On Demand 70 user/month • Siebel CRM 70 user/month • Oracle E-Business Suite CRM N/A • PeopleSoft Enterprise CRM N/A • JD Edwards EnterpriseOne CRM N/A 	<ul style="list-style-type: none"> • Contact Manager 5/user/month • Group 25/user/month • Professional 65/user/month • Enterprise 125/user/month • Unlimited 250/user/month 	75 user/month

V. THE CRM FAILURES

CRM is one of the most effective tools for improving customer relationships and therefore increasing revenue, customer satisfaction and customer retention. Unfortunately, some CRM strategies fail. This leaves CRM vendors and their customers baffled, but there are a few common reasons why a CRM strategy will fail [11], [12].

For more than a decade, research studies have shared that anywhere from 20 percent to over two-thirds of all CRM software deployment efforts have either failed to meet expectations or failed outright. Analysts such as AMR, Economist Intelligence Unit and Forrester Research have been studying the problem for over a decade and each has broadcast the alarming failure statistics along the way:

- In 2007 AMR Research: 29% CRM failure rate;
- In 2007 Economist Intelligence Unit: 56% CRM failure rate;
- In 2009 Forrester Research: 47% CRM failure rate [13].

The main reasons why CRM fail are:

- Too much focus on the CRM vendor and technology;
- Not enough focus on the customer;
- Rushing into CRM adaptation.

CRM software failures result in material financial losses, business disruption, months or years of misallocated time, red ink, upset customers and sometimes permanent damage to reputation. Many have been known to include career casualties and some have even been cited as contributing causes to disappointing financial performance results during earnings calls. Yet the well publicized tragedy is magnified as these failures have been reported for over a decade.

The answer to the question why implement CRM software at all, is that because it's a cost of doing business. Failing to adopt a customer strategy and supporting that strategy with software automation will most certainly leave your business vulnerable to competitors who do align their businesses with their customers and supporting business software. While

choosing the wrong CRM application can be a significant contributing factor to CRM failure, a poor software selection decision, and the following software deployment challenges are not software dependent.

Also, many times these business software projects weren't complete failures [14]. They may have produced some benefits, just not all the benefits the stakeholders used to justify approving the project, or sufficient benefits to realize a positive return on investment.

The CRM failure trend is far from hopeful, but the underlying facts and root cause analysis reveal several contributing factors which suggest better preparation and planning can mitigate failure. Most studies over the prior decade share that most CRM failures result from a limited number of causes. All these causes can be prevented if they are prepared for and identified at the earliest occurrence. When you recognize why CRM fails you can take proactive measures to make sure your CRM project succeeds.

VI. CONCLUSION

Based on all above mentioned in this paper it can be concluded that the choice of CRM software depends on the needs of the company and one of the key factor of successful implementation of CRM solutions is willingness to change, discipline in the system use as well as human and financial resources.

The main reason for this is that this kind of project is characterized by a large scope of unseen costs and resources spent, which are difficult to predict.

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Importance of CRM Software in Enterprise and Direction of Their Future Development

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Abstract: Nowadays, many organizations and enterprises are rushing to become more customer focused. A key component of many initiatives is the implementation of Customer Relationship Management (CRM) software. CRM systems has emerged as a way for businesses to streamline customer-related processes across functional areas, increase the efficiency and effectiveness of customer transactions at all levels and optimize service quality at each touch-point. This paper is focused on the importance of CRM software solutions for enterprises. Also, it is presented future of the CRM software and direction of their further development.

Key words: CRM Software, Cloud Computing, Software as a Service, Mobile CRM.

I. INTRODUCTION

Customer Relationship management is the strongest and the most efficient approach in maintaining and creating relationships with customers. Customer relationship management is not only pure business but also ideate strong personal bonding within people. Development of this type of bonding drives the business to new levels of success.

Once this personal and emotional linkage is built, it is very easy for any organization to identify the actual needs of customer and help them to serve them in a better way. It is a belief that more the sophisticated strategies involved in implementing the customer relationship management, the more strong and fruitful is the business. Most of the organizations have dedicated world class tools for maintaining CRM systems into their workplace.

This article introduces the importance of implementation of CRM in all fields of business, especially in small enterprises, its advantages and positive results of their applicability. It is also presented possibilities and directions of CRM future development.

II. DEFINING CRM

CRM represents systems, processes and procedures that help companies manage their customer relationships. CRM is a combination of processes, methods, systems, and technological know-how that will help the company deal with their customers effectively and efficiently.

The goal of the CRM is to retain and increase customers of the company. Customer relationship management is an approach designed specifically for corporations. It is a strategy whose main aim is to create

as well as maintain long-term relationships with the corporation's customers. The main goal is to expand the company's client base.

CRM also presents a comprehensive system. It encompasses customer service but it goes beyond that. It is a system that involves and regulates all points of contact and business dealings with the company's customers. The CRM strategy is focused on how customer service representatives are going to deal with the customers. However, aside from the actual interaction, CRM will monitor and regulate all the communications used in the interaction.

For instance, CRM will have identified the reports that need to be generated after a customer has been given service. The CRM strategy will also be the basis for determining what notes will be written and filed about the customer interaction. As such, CRM will include how records on customers are kept. For instance, if a customer service representative makes a note about the customer's concern, the CRM software used may automatically compile the notes and update the general customer service database. Thus, when another customer service agent picks the call the next time the same customer calls back with the same concern, the customer will not have to explain his situation again. The CRM software ensures immediate access to information that would make the interaction between the customer and the customer service representative as smooth as possible.

A working CRM program would therefore include the acquisition of new customers and return business. It is concerned with isolating customers that would require a specialized line of service. A good CRM program and strategy will improve customer service. This can be done by developing a communication process that provides customer solutions in a timely manner. This can be done through the following ways:

- *Provision of information is essential.* Information about company's business products, products' uses, company's alternative services, troubleshooting guides, frequently asked questions and answers should be easily accessible and available. This can be provided on websites 24 hours a day and 7 days a week using a remote server.
- *Isolate customers' definition of quality.* It should be exerted every effort to ask every customer (through polls, surveys, etc.) about their idea of a

winning customer service experience. With this on mind, company would be able to paint a clearer picture and devise a strategy that would meet the requirements and expectations of its client base.

- *Fast and efficient customer support should be ensured.* After customers have made their purchase, company still has a responsibility to their customers. It should be devised a system that would allow to manage and schedule post-purchase client interaction post haste. This would enable managers of the company to evaluate dissatisfaction, common customer support concerns, repurchase times, probabilities, and frequencies.
- *Install an efficient database for monitoring purposes.* Provide a structure that can allow to keep an eye on all interactions between the client and the company. All necessary sources and types should be included. It will also be beneficial if the system provides the same information that the customer sees and uses. This would eliminate or at least reduce confusion.
- *Be insightful.* Identification of an impending concern will provide a good image for the company by lessening customer complaints [1].

Customer relationship management is about managing all facets of company-customer relationships. This includes using all the advanced technologies, methodologies and systems that can ensure that company's customer will return and bring the referral business as well.

III. IMPORTANCE OF THE CRM

CRM represents new and very useful innovation in customer service today. CRM helps the management and customer service staffs cope with customer concerns and issues, and also involves gathering a lot of data about the customer. The data is then used to facilitate customer service transactions by making the information needed to resolve the issue or concern readily available to those dealing with the customers. This results in more satisfied customers, a more profitable business and more resources available to the support staff. Furthermore, Customer Relationship Management systems are a great help to the management in deciding on the future course of the company [2].

As mentioned, there is much data needed for the CRM system to work. These fields include the customer name, address, date of transactions, pending and finished transactions, issues and complaints, status of order, shipping and fulfillment dates, account information, demographic data and many more. This information is important in providing the customer the answer that he or she needs to resolve the issue without having to wait for a long time and without going to several departments. With just a few mouse clicks, a customer support representative for example can track the location of the customer's package or order. This is infinitely better than the cumbersome process of tracking shipments

previously. Furthermore, the customer service representative will also be able to see the previous concerns of the customer. This is a great help especially if the customer is calling about the same issue since he or she will not have to repeat the story all over again. This results in less time in resolving the issue, thus, higher productivity of the support staff.

CRM systems are also important to the top management because it provides crucial data like customer satisfaction and efficiency of service by the frontline crews [3]. A piece of customer relationship management software will also be able to generate the needed reports for product development or new concepts. Furthermore, this system will also be a great help for the top management in deciding the company's future course of action, whether it involves phasing out one of the products on the shelves or making adjustments to one of the products sold.

The reports generated by CRM systems are also invaluable to advertising and marketing planners of the company, as they will be able to pinpoint which ideas works and which do not. Because of CRM systems, the company will be able to release advertisements or plan marketing campaigns more in tune with their target market. This will also lead to more responses to company's advertisement and a more effective marketing campaign [4].

A CRM system helps a lot in expanding company's business. As CRM systems are capable of handling enormous amounts of data, they also will help a lot in coping with the increased numbers of customers and data. With a CRM Customer Relationship Management system installed and properly utilized, every company can be sure that all data is maximized and used to ensure that its business will be successful and customers a lot more satisfied than before.

IV. HOW CAN CRM HELP SALESFORCE

When companies purchase a customer relationship management system, they are often surprised to find that the new solution is not always immediately embraced by the salesforce. In fact, some sales reps believe that the primary purpose of CRM is to enhance sales management functions such as performance reporting and forecasting, and that it does little to make the day-to-day activities of the salesforce easier and more effective. Others may perceive CRM to be too complicated, and fear that the solution will add a new layer of complexity to their jobs [5].

But, for many businesses, CRM has clearly demonstrated its ability to provide immediate value to the salesforce by improving their ability to sell, and significantly increasing their success rates. In fact, a recent survey conducted by research firm CSO Insights found that almost 72% of firms surveyed indicated that CRM was having a positive effect on salesforce performance.

CRM can benefit the members of company's salesforce in five key ways [6], [7]:

- *Increased Productivity.* Almost every salesforce is burdened with numerous routine, cumbersome, manual procedures that can disrupt sales cycles and interfere with actual selling time. A CRM solution can streamline and automate pricing, order processing, and other administrative tasks, so reps can focus their efforts on those activities that directly impact revenues and profits, and spend more time working with potential customers.
- *Stronger Relationships.* CRM solutions provide highly-interactive analytical tools that empower a salesforce with valuable, timely, and accurate insight into buyer interests and needs. This allows reps to have better, more productive conversations with their prospects so they can build stronger, more personalized relationships with buyers which can help shorten sales cycles, increase the number of deals closed, and boost revenue-per-sale.
- *Best Practices.* With a CRM solution, a company can identify the activities that are most likely to result in sales success, and use that knowledge to implement and share a best practices methodology across their entire salesforce.
- *Enhanced Communication.* CRM systems can help close the communication loop between the salesforce and sales management, as well as the support teams who will service the customer after the deal is closed. This ability to share critical, time-sensitive information about a sale in progress can help make the entire end-to-end sales cycle more efficient, and help the salesforce close deals and earn their commissions faster.

Reduced Costs. A CRM solution can reduce sales costs by increasing the accuracy and effectiveness of related processes. For example, when the dollar value and product mix of deals are forecasted more precisely, inventory costs can be dramatically reduced. Additionally CRM can minimize order errors, saving the salesforce significant amounts of time by reducing the need to re-process incorrect orders, and eliminating the costs associated with replacing incorrect items that have been shipped to customers.

V. POSSIBILITY OF FAILURE OF THE CRM STRATEGY

Customer Relationship Management is one of the most effective tools for improving customer relationships and therefore increasing revenue, customer satisfaction, and customer retention. Unfortunately, some CRM strategies fail. This leaves CRM vendors and their customers baffled, but there are a few common reasons why a CRM strategy will fail [8], [9]:

1. *Too much focus on the CRM vendor and technology.* Some companies get too caught up in having the best possible CRM strategy out there. Some companies want entire call-centers, On-Demand CRM, Web-based, and Blackberry devices which allow their IT people to enter customer information wirelessly. While these

technologies are extremely helpful, too much emphasis on them can lead any company astray. It is naturally very important to select the best CRM vendor for company, but best does not always mean flashiest.

2. *Not enough focus on the customer.* Companies can focus too much on technology and strategy, and not enough on what is at the core of CRM: the customer. The first letter in CRM stands for "Customer" and so the customer should be first when thinking about any CRM strategy. A call-center can be wonderful if it is customer friendly. However, some call centers are too complicated and alienate the customer from the company. Alienation is the exact opposite of what companies want to achieve when implementing CRM. In order to have success with CRM, a company must work towards building a strong relationship with its customers. CRM is the path through which the customer and the company can understand each other. Focusing on technologies and ignoring the basics of customer service will cause even the most technologically advanced CRM strategy to go wrong.
3. *Rushing into CRM adaptation.* Sometimes, company presidents get the idea of CRM into their head and decide that their entire company must be CRM-ready as fast as possible. Rushing into CRM is a recipe for disaster. IT workers need to understand the concept of CRM. Someone who understands the importance of CRM will be better suited to deal with customers and reach the company's goals concerning CRM. Rushing into CRM does not allow ample time for all IT people to be briefed on the basics of CRM and how it will be implemented within the business. Some companies implementing CRM have to create entire departments that never existed before. The greatest care must always be taken when creating an entire new section of a company. CRM should generally be implemented across the entire company. If this is rushed, it can lead to all sorts of compatibility issues, customer confusion, and even employee confusion. Companies using CRM technology such as Blackberry devices, or Call-centers must be even more careful when implementing CRM for the first time. Technology is not perfect, and problems can occur at any time.

CRM software failures result in material financial losses, business disruption, months or years of misallocated time, red ink, upset customers and sometimes permanent damage to reputation. According to analysts such as AMR, Gartner, Forrester Research and IDC, that have been studying the problem for over a decade and each has broadcast the alarming failure statistics along the way that is presented:

- 2005 AMR Research: 18% CRM failure rate
- 2006 AMR Research: 31% CRM failure rate
- 2007 AMR Research: 29% CRM failure rate

- 2007 Economist Intelligence Unit: 56% CRM failure rate
- 2009 Forrester Research: 47% CRM failure rate

Some say that it is impossible to determine whether CRM is a success or a failure [10]. A company that avoids the pitfalls of CRM implementation will notice a dramatic increase in customer satisfaction, retention, and acquisition. CRM can help any company significantly if it is used correctly, carefully, but still efficiently. CRM technology can also help companies if it is used thoughtfully and timely. The entire company must be prepared for CRM when it is implemented. A company cannot expect exact numbers immediately after putting CRM into effect. CRM is a long-term strategy that will help achieve long-term goals of a company. Customer focus is essential and will help any CRM strategy to become a success.

VI. FUTURE DEVELOPMENT OF CRM

With CRM technologies evolving, one of the important selling points has been the ability of CRM systems to provide a 360 degree view of the customer. Having an integrated view of the customer has helped organizations to keep all departments (Sales, Service, Finance etc.) on the same page and thus in turn provide a consistent service to the customer [11]. Essentially, what has been captured in the 360 degrees view is the transactional behavior of the customer.

The transactional data has been mainly classified under 3 sub-categories:

- Transaction data like sales orders, billing, receivables and warranties;
- Account data that would include receivables, outstanding balance, account hierarchies and credit history;
- Interaction data, essentially capturing communication from all customer touch points like emails, chat and call center.

A lot of information is available on the social network that can be utilized to improve customer view within the organization. Below are few thoughts on how an organization could look beyond the conventional 360 degrees and capture the behavioral pattern.

- *Capture customer demographics through Social IDs – Social CRM.* Social CRM, as such, is use of social media services, techniques and technology to enable organizations to engage with their customers. For this to happen, one of the first things that would need to be done is providing placeholders for LinkedIn IDs, Twitter IDs and Facebook IDs in the traditional CRM systems. Profile information and customer demographics can be collected by integrating the CRM systems with the social network using these identifiers. The collected information can be used to identify customer demographics, likes/dislikes, important milestones etc. Often customer demographics in the organization's database go

outdated and there is a greater probability that the customer might have been updating this information more periodically in their social forums. A client manager with a mandate to interact closely with few select accounts would benefit if that extra information is made available about his or her customer beyond the typical transactional record. A lot of ecommerce websites have started using Facebook logins for customers. As per Facebook statistics, more than 80% of internet sites are integrated with Facebook. Once the customer logs in using a Facebook ID, you get direct access to the customer profile information and this data can be used to capture customer demographics, recommend products, suggest gift ideas for social connections etc [12].

- *Capture customer conversations.* Organizations can build an unbiased community site and encourage customers to be a part of it. Mechanisms can be put in place to use the information to improve product features and service. Often, a product's technical flaws go undetected in the in-house labs and it becomes imperative to hear from the customers to iron out potential defects before it is too late. If a mobile phone company has launched a new smartphone and would like to keep a track of customer sentiments and product performance, it would help to listen to what the customers are saying on the social forum and this can help iron out potential product issues.
- *Customer Influence Index.* Organizations can capture customer influence wielded in community sites with regards to the recommendation of the products and services. They can rate the influencers by using metrics like Customer Influencer Index and this would be an indicator of the influence the customers wield on the social network. These customers can be segmented separately as they are the extended sales team for the organization and can be suitably rewarded by being invited for new product launch, limited edition product release etc.
- *Obtain periodic online feedback.* Often the feedback has been one time; however it is important to make this more frequent. In a typical product lifecycle, it is important for new features to be added to remain ahead in the competition. Product teams can look at the customer suggestions to drive product development. HP has a dedicated customer support forum wherein users can provide periodic feedback. This insight is then used to develop or improve product features.
- *Monitoring customer needs.* An existing customer might be researching on a product that the company offers. This can be tracked through web crawlers or other available software and utilized for direct marketing. Social media is

where consumers believe they can make much better-informed decisions by following the advice of their friends and other consumers

- *Nurturing customer relationships.* Organizations can utilize social media to keep a track of key moments in the life of a consumer beyond what had been captured in the 360 degrees systems; e.g., people who have got married, or have changed jobs. This information can be used to upsell, cross sell or surprise customers with gifts. There is an example of how KLM, a popular aircraft carrier collected information from Social Media, picked a personalized gift for select customers and delivered the gift to them. This gesture of KLM is an ideal example of organizations tapping social media to capture additional information and making their customers feel special.
- *Utilize alternate channels of communication with customer.* A customer may have his car repaired, the service center can encourage the customer to provide miles reading and other operational parameters like mileage etc. after periodic intervals using channels like smartphones and this data can be used to measure the service efficiency. This in turn can improve internal service operations.

However, this does not mean that we can do away with the traditional 360 degrees view. They would still continue to exert significant importance and the behavioral information from the social media would complement to understand the customer better and forge more fruitful relationships. Recently, there has been a growing concern on the security aspects of personal information being shared across social media [13].

With growing number of success stories as highlighted in the few examples, the time has come for organizations who already have implemented 360 degrees customer view in their systems to improve it and look beyond the transactional behavior of the customer. Organizations now must ready themselves for obtaining customer information through new sources and build new columns in their database tables to capture this information.

Integrating the traditional CRM systems with social media tools is very important else the CRM system could end up becoming a middleware solution storing only the transactional behavior of the customer. A 360 degrees view needs to be redefined to capture the social behavior, to forge more meaningful and effective relationships with customers.

The benefits that can be achieved with a Customer Relationship Management (CRM) solution are clear – enhanced productivity, reduced costs, increased revenues, and improved customer acquisition, service, satisfaction, and retention. Yet, for many small and mid-sized businesses, the large initial investment needed, combined with the long, expensive implementations required, make most on-site licensed CRM packages too cost-prohibitive [14]. Additionally, few companies can devote their

limited IT resources to installing and configuring hardware and software, testing the application, and supporting ongoing maintenance and upgrades.

Cloud CRM provides a simpler, faster, and more affordable way for businesses to take advantage of powerful technology tools that streamline and automate the way customer interactions are managed across touch-points [15]. With Cloud CRM, all hardware and software components are purchased, installed, tested, and maintained by a third-party hosting provider at a remote site. The hosting service provider also stores and manages all customer-related data. Companies need nothing more than a standard Web browser to access and utilize the CRM application and its features. Cloud CRM makes customer relationship management easier and more cost-effective for businesses with IT and budget constraints. It provides all the standard functionality of licensed CRM solutions, as well as the security, reliability and performance companies need to ensure smooth customer operations, without the time and expense associated with in-house systems.

As companies strive to remain competitive by operating in a more customer-centric manner, the need to keep staff members fully connected to client data at all times – even when they're on the road – has become increasingly important. Sales reps, field service workers, and other customer-facing personnel who travel frequently require any-time, anywhere access to the timely, accurate data that will enable them to acquire and support customers as efficiently and effectively as possible [16].

That's why leading analysts expect the market for *mobile CRM* applications to experience explosive growth in the near term. In fact, research firm Gartner predicts that industry expansion could be as high as 40 to 60 percent over the next two to three years. And, a Forrester Research study shows that nearly half of all businesses in North America and Europe have already deployed – or are planning to deploy – mobile sales force applications.

A *mobile CRM* application is a powerful, full-featured software solution that allows field workers – such as sales representatives, service staff, and support teams – to access and interact with customer data while they're on the road [17], [18]. Using cell phones, Blackberry devices, Windows Pocket PCs, and other Web-enabled handheld appliances, users can retrieve and update customer-related information from back-end systems, manage opportunities and jobs, process orders, check inventory levels, and much more, just as easily as if they were in the office.

There are numerous benefits that can be achieved through the implementation and use of a mobile CRM solution. Among the greatest advantages are:

- Increased efficiency and productivity of field staff.
- Improved face-to-face interactions between clients and employees.

- Enhanced information flow and sharing throughout the entire organization, even among workers who are on the road.
- Increased accuracy and timeliness of information, through the ability of all field workers to make instant updates to data at any time.
- Reduced sales and service costs through remote automation, and the facilitation of faster, more informed decision making.

Many businesses are deploying *Software-as-a-Service* (SaaS) CRM. Software as a Service is a software distribution model in which applications are hosted by a vendor or service provider and made available to customers over a network, typically the Internet. SaaS is closely related to the ASP (application service provider) and on demand computing software delivery models. IDC identifies two slightly different delivery models for SaaS. The hosted application management (hosted AM) model is similar to ASP: a provider hosts commercially available software for customers and delivers it over the Web. In the software on demand model, the provider gives customers network-based access to a single copy of an application created specifically for SaaS distribution.

Benefits of the SaaS model include: easier administration, automatic updates and patch management, compatibility (all users will have the same version of software), easier collaboration, and global accessibility.

In just a few years Customer Relationship Management has emerged as a powerful business trend. However, the best of the CRM is yet to come. By implementing a cloud phone system or managed social media support network, a company can not only stay ahead of these constantly evolving trends, but also improve their customer loyalty and support today, rather than two or three years from now.

VII. CONCLUSION

CRM solutions come with a whole range of solutions that can benefit the sales department, or simply take up space on the host server. Before implementing a CRM system, it is important to identify those features that are needed and those the organization can do without. Clearly defining both lists will ensure the optimal control over the cost of the solution, whether it is hosted or implemented in-house.

Once management has a clear understanding of why a CRM system should be implemented, it is important to develop a strategy for solution selection and implementation. This includes outlining the appropriate time-frame for implementation and training.

By taking the time to look at the key elements of growing business within any CRM system, every company can better position itself for growth, enjoying the measurable benefits afforded in a robust system selected and implemented to fit the needs of the organization today and into the future.

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Presence of E-business in the City of Zrenjanin

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Abstract – Electronic business can be defined as and simply means doing business on the Internet. It involves not only online selling and buying but also communication with clients, suppliers and partners. This kind of technology allows companies to send more information for less time and money. This is exactly the reason why companies strive to transfer their business on the Internet.

Zrenjanin, as a province which is situated near two big Serbian cities, Novi Sad and Belgrade, was an interesting place for examining whether electronic business is present in this city or not.

A survey was conducted among firms and people who live and work in Zrenjanin, and the main results and conclusion are presented in this paper.

I. INTRODUCTION

The term electronic business (e-business) was first used by the U.S. Company IBM, in 1996, to indicate doing business with application of modern, electronic technology.

Electronic technology involves the combined use of information technology and telecommunications. This type of technology allows you to send large amounts of information over long distances in a short period of time. Because of this, companies that use these technologies in their business achieve significant savings in operating costs, they are more efficient and they become more competitive in the market.

E-business is not just about buying and selling, but also the organization of business in the network environment. Another thing that electronic business made easier is the organization of business communication to customers and "taking care" about them.

Today, electronic business is making expansive growth in retail, publishing and financial services. The advantages of electronic over traditional business refer to increasing the quality, agility and additional services on one hand, and to reducing products prices, accelerating time to present in the market and executing transactions on the other. It also intensifies the development of electronic partnerships.

Transfer from traditional to e-business starts with the large investment at the beginning of this process. That stage is followed by the learning process of how to use new technology. At the end, the benefits obtained by this whole process bring pleasure and enjoyment.

Zrenjanin is a small city in Vojvodina (a county in north part of Serbia). It is also very close to Belgrade (the capital of Serbia) and Novi Sad (the biggest city of

Vojvodina). That is the reason why it was interesting to examine whether these new technologies are present in Zrenjanin and to what extent.

II. METHOD

A. *Research Objectives*

The research was conducted using questionnaires.

There are three aspects of e-business that were included in this study:

- E – trade: ordering and paying products online (by users and companies);
- E – marketing: advertising through the Internet;
- E – communication: using electronic mail (e-mail).

Zrenjanin is a place with small population and low level economy. Most companies, whether private or public, does not use the Internet for their business. The research objective was to determine whether the e-business is present in Zrenjanin. In order to do that, three sub-objectives were taken into account:

- Determining whether the companies use the aspects of e-business;
- Determining whether the employees in companies are willing to use new technologies;
- Determining whether the citizens of Zrenjanin are open for e-business.

B. *Survey Design*

Survey was conducted in three parts, following the above-mentioned sub-objectives. There were three types of questionnaires – for random citizens, for employees and for firms. The questions formed for the questionnaires were clear and short. Most of them were closed type questions. At the end of every questionnaire, there was a place where examinee could leave his/her comment about e-business.

III. RESULTS

A. *Companies*

Ten companies were included in this phase - five private and five public (owned by the state).

The questionnaire made for the companies consisted of 13 short closed questions. The goal was to determine

whether the surveyed companies use aspects of e-business and to what extent.

Following results were obtained (divided by the above-mentioned aspects of e-business):

- E – trade:
 - 20% of the companies provide e-shopping for their clients;
 - 20% of the companies offer e-payment for their goods;
 - E – ordering for the needs of the company is equally present as the classical way of ordering.
- E – marketing:
 - All the companies have websites;
 - 70% of the companies advertise on the Internet;
 - 60% of the companies increased profit with these advertising;
 - 90% of the companies have established contact with foreign companies by using the Internet.
- E – communication:
 - Communication by e-mail is equally present as by classic mail.

It could be concluded that e-business is present in the surveyed companies. E-marketing is the most popular aspect of e-business, while e-trade comes last.

B. Employees

In the second phase, twenty employees from the surveyed companies were asked to complete the questionnaire.

The questionnaire consisted of five questions, mostly closed type questions, with the goal of determining if the employees in the surveyed companies are willing to use the Internet for performing their tasks.

The following results were obtained:

- All the employees use the Internet in their workplace for performing tasks;
- 50% of the employees had some sort of training for working with Web applications and computer in general;
- 90% of them think that using the Internet for work is not complicated;
- 85% think that using the Internet has increased their efficiency;
- 75% of the interviewees have positive attitude about this technology; it is important to emphasize that the remaining of 25% has no opinion and no one has negative attitude.

The conclusion is that surveyed employees are willing to use new technologies and to learn about them.

C. Citizens

In the third phase, twenty people of different age and occupation residing in Zrenjanin were questioned.

The questionnaire consisted of seven closed type questions. The goal was to determine whether the citizens of Zrenjanin are open for e-business.

The following results were obtained:

- 75% of the citizens use the Internet;
- All the citizens who use the Internet use e-mail;
- 80% of the ones who use the Internet find information about products online;
- Only 27% of the people who use the Internet shop online;
- 7% of the people who use the Internet use e-payment and possess e-card;
- At the end of the questionnaire, a space was provided for the interviewees to leave the comment about e-business. In general, the comments were positive (e.g. e-business can save time). The main reason for not using it is the lack of security.

It could be concluded that most people in Zrenjanin use the Internet, but the number of those who use the aspects of e-business is negligible.

IV. CONCLUSION

The objective of this research was to determine whether e-business is present in Zrenjanin and to what extent. In order to do that, the author conducted a survey divided into three phases. Each phase was meant for different groups of people.

After summing up the results of the each phase of the survey, it was concluded that e-business is present in Zrenjanin. As for the aspects of e-business, e-trade is poorly present. Some of the companies do have it but the users are not willing to use it. E-communication is present and all of the examinees who use the Internet use it. E-marketing is successfully used by the companies in Zrenjanin.

This research was conducted individually by the author, hence the small proportion of the number of examinees. It would be interesting to increase the number of surveyed subjects and to repeat this research several years in a row. In that way, we could see not only the current situation but also the way it is changing.

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Access and Support E –Trade for Successful Sale on the Internet

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Abstract - Modern trade is conducted via the Internet, a success for the electronic market is necessary to develop consumer awareness about the development of trade through the Internet, which is not the case in Serbia. The research presented in this paper are connected Internet, e-commerce and online shopping Internet. This paper describes the business case company P...S... fashion. Made the situation analysis, identified the problems and concrete solutions are the problems.

I. INTRODUCTION

Brand "P. ... S. ... fashion" is dedicated to placing the most exciting and varied products in the fashion market.

Led by a team of designers, "P. ... S. ... fashion" has a unique position in the market with his inspiring collection of fashion accessories, reasonable prices and good quality.

The secret of success lies primarily in relying on a team that is responsible, motivated and innovative in proposing and accepting always new and interesting ideas. In particular, thanks to the work environment that is built on dialogue, on mutual trust and teamwork, and willingness to learn from their mistakes, they became one of the most prestigious local companies engaged in the design, production, placement and sales of garments, supporting details and jewelry for women.

The company "P ... S ... fashion" firmly believes that the latest IT devices not only offer a "hi-tech" solutions for the administration, but also enables the prediction and forecasting trends, customer requirements, and the design production capacity .

II. SITUATION ANALYSIS

A. Social and cultural factors

Real "P. ... S. ... fashion" is the most attractive for the higher values cit income, or top layer. Quick to the act of living and increasing number of working women, and the transition to the European working time, cause the emergence of online shopping.

B. Media

The media is an important participant in the promotion. Biggest cooperation is achieved with television and the Internet, because they cover a significant percentage of the target group.

During the winter months, more attention is being paid to Internet sites, commercials, because then people due to cold weather, spend more time at home.

In this period should not be used billboards as a way of advertising because bad weather (rain, snow) and reduce onemogućavaju visibility and impressiveness.

C. Analysis of Market

Demand

Demand is a major uptrend. But this year the demand varies. The biggest sales are in the winter months and autumn / spring, when demand tends to fall during the summer months. Consequence of the holiday season and the absence of its customers and their consumption focus on the holidays.

Mission and Vision

Mission "P. ... S. ... fashion" to a rich assortment of high quality, meets the desires and tastes of consumers.

Vision "P. ... S. ... fashion" is that as a multinational company to become and maintain its leading position in the European market and develop a positive image of themselves and their products, successfully positioned as trademarks.

Goals and Objectives

Long-term goals:

- To preserve and further strengthen its leading position in the textile industry in the Serbian market, and beyond;
- Creating awareness of consumers about products and creating a recognizable image of a strong brand and a

Short-term goals:

- Increase market share by 10%
- Achieving greater profits in the coming year

In order to realize the goals it is necessary to fulfill the following tasks:

- Ongoing customer care;
- Constant innovation;
- Monitoring international trends and momentum from the market;

- Improve services and better coverage of markets;
- Open a new fashion house "P. ... S. ... fashion," Active promotion;
- Design and installation of Internet pages;
- Creation of a good information system;
- Achievement of good cooperation with business partners;
- Continuous improvement of business employees.

Evaluation of marketing strategies

Market Segmentation

Its product portfolio "P. ... S. ... fashion" covers the entire market (all age groups of the population) SCG. As the largest single out potential customers Maggiore and the middle generation.

Most customers belong to a group of supporters of variables, which prefer certain items, but not the usual shopping habits. Therefore, they can easily motivate promotional activities on the purchase, and quality and low price to motivate the arrangements.

TABLE I. THE TARGET GROUPS OF THE OVERALL PRODUCT MIX

Market segment	circumstances consumption	Target group	Features	Needs
1	Consumption outside the home	teenagers	Curiosity and love to share clothes	acceptable price
2		students	Regular users love to share with each other	Ego-gratification of vanity
3		staff	A large loss of energy,	availability
4	Consumption in the home	family	Monthly or weekly purchases	acceptable price
5		older people	buy other	action

Product Strategy

Product mix of "P. ... S. ... fashion" consists of two main product lines: the collection spring / summer and autumn / winter. Each line seems more sub line.

The entire product mix "P. ... S. ... fashion" is completely consistent, which means all connections in the final consumption of the product, production process, and in particular sales channels and promotions. The products are of high quality for the production of the materials supplied to the European market.

In addition the company in his laboratory, performs a re-examination of all raw materials and thus ensure high quality.

Strategy for price

"P. ... S. ... fashion" strategy applied to high prices compared to the competition. This strategy allows the company taking significant market share and separated from the other, and achieving leadership position in space Serbia and Montenegro. Despite high prices, the company creates a high level of income (the annual award by the magazine The Man, "People of the Year 2011" Fashion House "P S. ... fashion ", won the award in the category - BEST BRAND OF SERBIAN).

Setting high prices resulted from several main reasons:

- The difference from the competition
- The possibility of deferred payment
- At the end of the season, the opportunity to purchase the shares, even where prices are affordable and middle-income ie. middle and lower strata of population

Distribution Strategy

The broker network: The company has a sales network comprising over 20 stores "P. ... S. ... fashion." They are found throughout the country in Belgrade, Kragujevac, Novi Sad, Nis, etc.. Some of the "P. ... S. ... fashion," there are in Malta, in Vienna. All retail stores have different decoration items and sell only "P. ... S. ... fashion."

The intermediary sales channels: Conventional channels consisting of independent retailers that provide services to the sale of our products and **vertical marketing channels** that consist of contractual vertical marketing system (franchising system).

Promotional Strategies

The current strategy of promotion was undeveloped, ie. little of the budget was spent and very little attention has been paid to any promotional activities. Consequently there has been a major problem in building brand awareness of consumers.

In the past, fashion house "P. ... S. ... fashion", responding to humanitarian actions and calls from their surroundings.

In Zvezdara Theatre held charity fashion show "grain by grain", where the fashion house "P. ... S. ... fashion" stream participation.

Every funds raised from ticket sales were donated to the Home for Children and Youth in disturbed development "Sremčica". This House, "P. ... S. ... fashion," gave a significant number of garments in order to cheer its residents beautiful clothes.

Little has been allocated for the economic propaganda and continuous PR activity.

D. SWOT Analysis

TABLE II. SWOT ANALYSIS

<p>Strengths</p> <ul style="list-style-type: none"> * High participation in meeting the demand in the market industry SCG; * Application of Standards and Technology; * A stable financial base * Chain and more than 20 of its own stores under the name "P. ... S. ... fashion"; * The policy of high prices for high quality product; * A wide range of 	<p>Weaknesses</p> <ul style="list-style-type: none"> * Wide range of products on offer and in comparison to a lot of competing products; * Weaker consumer information about the company and its product portfolio; * Lack of permanent promotional activities; * Undeveloped public relations; * Lack of market tradition
<p>Chances</p> <ul style="list-style-type: none"> * nactivity main competitors in the design, programming and implementation of tailored and comprehensive promotional activities; * Good cooperation with retailers; * Raising awareness of consumers about the products and their quality; 	<p>Threats</p> <ul style="list-style-type: none"> * The presence of competing products from the former Yugoslavian republics, which are still well positioned in the market of Serbia and Montenegro; * The existence of unfair competition behavior * Increasing imports; *The reaction of competitors to the promotional efforts

III. IDENTIFICATIN OF THE PROBLEM

The basic problem is to determine what the company "P. ... S. ... fashion" must do to successfully competed in international competition over the next few years.

"P. ... S. ... fashion," to preserve and further strengthen its leadership position in the confectionery market Serbia and Montenegro, to develop a positive image in the minds of consumers about the company and its products. It is believed that the problem of access to Internet shopping, as well as the lack of lack of economic propaganda activities and ongoing PR activities.

IV. PROPOSED SOLUTIONS

Expansion of the chain "P. ... S. ... fashion" and discover new marketing channels will make the company strengthen its competitive position.

Advertising and promotional activities is discontinuous greatest weakness of the company. For this reason, the company needs to work on developing promotional activities to create consumer awareness of the product-mix and stirred interest in the products and buy them. The company needs to work on expanding to new market segments and explore new marketing channels.

A. Product

The complete product range of "P. ... S. ... fashion," are products of high quality and with such a policy, the company should continue in the future, and trademark their brand should not be changed, fixed period of time, to become recognized and position itself in the minds of customers. For each commodity should be in a visible place to emphasize a distinctive trademark to accompany each product and future activity.

B. Product price

In accordance with the basic idea and concept of operations, as well as the basic mission and goals of companies, prices are largely to be based on the settings chosen marketing strategy:

- The price of the product must be at least 10% lower than the competitors products;
- Product prices must correspond to the average purchasing power has been identified target groups;
- In addition to protecting the interests of the users of services, take into account the interests of the company.

High technology and the already mentioned conditions, enabling the successful implementation of this strategy price. Acceptable price with high quality products at the same time would be the main competitive advantage of the product. Hence, it will not disrupt ongoing efforts by companies vodostvom in quality. At the same time, this strategy will be a unique price, which is characteristic of the product "P. ... S. ... fashion," and even for consumer products.

C. Distribution and Sales

On-line shopping: You should take advantage of information technology so as to introduce on-line shopping. If desired, customers could on the Internet, on the website "P. ... S. ... fashion," to choose the items you should have in her closet.

D. Promotion

In order to ensure the recognition of "P. ... S. ... fashion" items, introduced the plate with the inscription P. .. S. .. and that is the trademark of the company.

Economic Propaganda

In the first month (in February) suggest an aggressive company with an emphasis on public service announcements on television. Parallel to and use billboards and to promote innovations in the mode of distribution (online) shopping.

billboards

Subject billboards should be adopted in the spirit of TV Companies issue (TV Spot with appropriate text)

The duration of this type of campaign is two times two weeks. The first time was in late May, when the planned advertising on several billboards in Belgrade, Kragujevac, Novi Sad and Podgorica.

The second period was late August when the planned announcement of the same intensity as in May. Billboards to be set on the promenade.

PR activities

PR activities should include:

- Press release with a unique logo and letterhead companies;

- Press Conference - stay in regular contact with journalists;
- Guest book sales in each building;
- Specific Clothing employees;

Strategies to improve sales

According to distributors: quantity discounts - each distributor saying that more than a defined minimum corresponding gains 3% discount orders.

According to consumers: akcijske promotions on products purchased two get third gratis.

E. Media and Website <http://www.ps.rs>

Using the Internet is becoming more prevalent among our population. Besides being able to be a relatively inexpensive and simple way, inform consumers about the company and product range, website image reveals the seriousness of the company to which it relates.

V. CONCLUSION

Fashion house "P. ... S. ... fashion," is evidence that in addition to underdevelopment and procedures of media exposure, as well as on-line shopping is at the top of the hierarchy. In an interview with the managers of this fashion house sales in spite of high prices and different line payment conditions are not yet in spite of meeting the most basic conditions for the development of e-business in Serbia, removed most of the barriers.

The proliferation and availability of high-speed Internet in Serbia is growing, the Law on Electronic Commerce, reduced taxes on computers, work began on a national strategy for the development of information

society in which e-business is recognized as a priority, there are more opportunities for Internet payments, most banks now issue cards that can be paid on the Internet, users have more trust in the Internet and pay more and more people decide to use electronic services that facilitate business.

However, although underdeveloped in Serbia, buying over the Internet and electronic commerce are beginning to develop a much faster pace than it used to be the case. Become available for new business opportunities, which increases productivity, lower costs and faster turnover of capital.

In addition to all the above, customers are hoping that will soon pass and the fashion house type of electronic trade even though they are not necessary, because the traffic is at a high level. But still the nerastrostranjenih fashion houses in each city, but is based on the major cities, most purchases would be done through on-line.

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Role of ERP Systems in Improving Organization Business

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Abstract - Enterprise resource planning is very important for any organization. To make the organization grow and operate successfully it has to optimize its business processes in large part. It is necessary to find solutions that will increase productivity and operate more efficiently. ERP systems ensure achievement of sustainable competitive advantage and creating conditions for profitable growth of companies. The introduction and implementation of ERP systems in organizations involves synchronizing all of its business functions. The successful implementation of ERP systems in the organization usually leads to lower inventory, reduced staff, better product quality, higher productivity and faster response time in communication with clients.

- **Finance** (accounting, bookkeeping, cash management, financial reporting, credit, etc.)
- **Manufacturing** (procurement, resource planning, capacity planning, material planning, work order management, quality management, etc.)
- **Sales and marketing** (sales planning, order processing, pricing, invoicing, proposals, contracts, etc.)
- **Human Resources** (recruitment, personnel records, personnel planning and development, wages, work rules, etc.).

I. INTRODUCTION

ERP (Enterprise Resource Planning) systems are information systems oriented on information support of most business processes. ERP systems integrate all organizational data and processes into a single system and represent software solutions for managing business support. The most widely used and accepted definition of the ERP systems is the one that alleges APICS (American Production and Inventory Control Society): ERP is a framework for organizing, defining, and standardizing the business processes necessary to effectively plan and control an organization, so the organization can use its internal knowledge to seek external advantage [1]. On the other hand, probably the simplest definition of ERP system is "one database, one application and a single interface within the entire organization" [2]. ERP is actually a software package that keeps track of all aspects of enterprise business. It introduces the concept of information system development with full integrity of software applications and data storage as a common resource that is shared by all applications.

Deloitte Consulting, in its report in 1998, defined ERP as package of business software that enables organizations to:

- automate and integrate the majority of its business processes
- share common data and best practices throughout the organization
- create and access information in real time.

ERP system is usually composed of the following applications:

II. ERP SYSTEM FEATURES

ERP systems have emerged as a response to management growing need for information in the conditions of market globalization and intensive development of information and communication technologies. Traditional information systems were characterized by isolated business functions (production, marketing, finance, etc.) and separate databases. In contrast, integrated information systems consist of connected modules that support all or most of the business processes in the company. It is about integrated business applications to support business operations, which are used in different parts of the company, and in which all data is stored in one database, which enables companies to control the basic functions of business, planning and strategic actions effectively [3].

ERP system is, therefore, business software that enables organizations to automate and integrate key business processes and share data and information. Thanks to that, it is bridged the gap in communication between organizational units, accelerated and simplified data processing, and provided a holistic view of the enterprise. The most important characteristics of the ERP system are:

- **flexibility and adaptability** (in spite of its complexity, ERP can be adapted to the needs of each company)
- **independence and comprehensiveness** (ERP is independent of hardware, operating systems, organizational structures and includes all or most of the business process)

- **modularity and openness** (ERP structure is composed of modules that can be connected via interface with other modules or a variety of internal and external software components)
- **availability** (ERP is not limited to the formal boundaries of the business system and can be available to its distant organizational units)
- **possibility of simulation real business conditions** (ERP has possibility to predict system behavior by using simulation scenarios for the purposes of making important business decisions).

III. REASONS FOR ACCEPTING ERP SYSTEMS

Organizations around the world implement ERP systems for various reasons, including, among others, replacing old legacy systems, standardization of systems and faster information processing in order to gain strategic advantage [4]. Acceptance of ERP systems, which includes turnaround in the way that company operates, is motivated by the following key reasons [3]:

- **Integrating financial information.** ERP systems create a unified view of enterprise performances and contribution of certain functions to overall company results.
- **Integrating information from customer relationships.** ERP systems provide continuous monitoring of customers orders from the moment of their receipt in the sales department, to the shipment of goods and sending invoices by the finance department.
- **Standardizing and integrating information from the domain of human resource management.** In complex and diversified companies with many employees, ERP systems allow comprehensive monitoring of all hired workers.
- **Standardizing and accelerating the manufacturing processes.** ERP systems enable reliable production and capacity planning, cost monitoring, enforcement of quality control, cost savings and time savings, as well as increasing productivity.
- **Reducing inventory.** The existence of unique database of procurement, production and storage enables efficient inventory management, resulting in lower costs and storage costs saving.

IV. BENEFITS FROM ERP SYSTEMS

ERP is a software package that monitors all aspects of a company. Its role is to improve the information flow between different parts of the enterprise, to improve customer service and facilitate business in generally. ERP systems provide achievement of sustainable competitive advantage and create conditions for development and profitability of the company. They impose approach of integrated systems and integrated information flows, by establishing a set of applications based on the best the

manner to perform processes. Because of reliable and timely informing, there is a reduction of costs and inventory, and flexibility in managing transactions and shorter production cycle ensures greater efficiency and better work performances [5].

Numerous benefits offered by ERP systems essentially can be divided into financial and non-financial. The most significant financial benefits of ERP system are [6]:

- **Decrease in inventories.** Effective planning and procurement management enable reducing inventories by 20%, because of purchasing only what is necessary, and this reduces storage costs.
- **Reducing procurement costs.** These systems provide information about projected needs of materials and other raw materials, as well as information about seller operations, which strengthens the bargaining position of the buyer and reduces the purchase price more than 5%.
- **Reduction of personnel and reducing labor costs.** ERP systems eliminate the need for certain human resource profile and ensure efficient work of all employees without unnecessary interruptions and repeating operations. This leads to labor cost savings up to 10%.
- **Improved sales and customer services.** Better coordination between production and sales and improvement of customer relationships, due to time reduction i delivery improvement, leading to increased customer satisfaction and increased number of orders, which increases sales by up to 10%.
- **Improved management and cash flow control.** Fast invoicing, timely reporting, and improved claim management lead to reduction of time payments by more than 18%. This provides the necessary cash inflows and adequate cash outflows management ensures balanced cash flow.

The most significant non-financial benefits of applying ERP system are [6]:

- better and more accessible information
- engineering tools that provide improvement of business processes and product design
- high level of sensitivity to clients' needs
- integration, standardization, flexibility and globalization of business
- efficient enterprise management
- ensuring operational efficiency and innovation
- creating flexible business processes
- advanced functionality and global orientation.

We can also talk about the measurable and immeasurable benefits that were noticed by organizations

using ERP systems in their daily business. Results of research conducted by Benchmarking Partners Inc, for Deloitte Consulting, are presented in [7].

TABLE I. MEASURABLE BENEFITS OF ERP SYSTEMS [7]

Measurable benefits of ERP systems	% of
<i>Reduction in inventories</i>	
<i>Reduction of personnel</i>	
<i>Improved productivity</i>	
<i>Improved order management</i>	
<i>Reduction of financial cycles</i>	
<i>Reduction of IT costs</i>	
<i>Reduction of purchasing costs</i>	
<i>Improved cash management</i>	
<i>Increased profits</i>	
<i>Reduction in transportation costs</i>	
<i>Reduced maintenance</i>	
<i>Improved on-line delivery</i>	

TABLE II. IMMEASURABLE BENEFITS OF ERP SYSTEMS [7]

Immeasurable benefits of ERP systems	% of
<i>Availability of information</i>	
<i>Improved processes</i>	
<i>Sensitivity to client requests</i>	
<i>Integration</i>	13
<i>Standardization</i>	12
<i>Flexibility</i>	9
<i>Globalization</i>	9
<i>Business performances</i>	7
<i>Supply Chain</i>	5

Understanding the benefits of ERP system and the ability to quantify these benefits become crucial for enterprises. It is important to note that the benefits are usually not realized immediately, during commissioning of ERP system in operation, but it often takes months or years to note benefits brought by this system. ERP market is currently one of the fastest growing markets in the software industry, and ERP solutions represent significant business investments that ensure competitiveness, sensitivity to clients' needs and the flexibility to run our business in a global economy [7]. The highest value of ERP systems is their integration that achieves the interconnection of all business processes and business units, as well as improving internal communications.

V. IMPLEMENTATION OF ERP SYSTEMS

ERP system is a software product that organizations can buy as a final product in order to integrate and share their information and related business processes within the functional areas and between them [3]. However, purchasing of ERP software by itself would not make enterprise to be ERP system, but it is necessary to all

enterprise resources be maximally committed to its implementation.

Implemented ERP system is able to integrate operations of various parts of the enterprise in one single unit. This gives the system throughout which is possible to manage all human and material recourses, as well as to planing, developing and monitoring business processes and procedures. The main role of ERP systems implementation is much more success in enterprise management in changeable and competitive environment.

Term of implementation by some authors means just technical implementation, and by some others the entire life cycle of ERP, that is complete process of adoption, selection, implementation and utilization of ERP systems. Both, however, agree that this is an extremely complex and dynamic process that requires significant technological and organizational efforts. The most mentioned goal of implementing ERP systems is the integration of all company functions and satisfying their needs using a single information system, which provides a unique view of the company business.

There are **three different strategies for ERP systems implementation** [3]:

- **Big Bang strategy** - the most ambitious and difficult approach that has dominated in ERP projects in early nineties of 20th century, and today it is almost not in use. It had implied immediately rejection of all previous systems and transition the entire company to the new system. Big Bang strategy required a tremendous effort in simultaneous adjustment of all actors to completely new way of executing business processes. In addition, early evaluation was not enabled and the advantages of using ERP systems were seen only after completion of entire project.
- **Franchising strategy** - the most frequent and longest lasting approach applicable in large and diversified companies that do not have many common processes between business units. This is a phase integration in horizontal direction. This strategy includes the installation and commissioning of licensee in selected ERP systems business units, and after successfully carried implementation, it is used as reference for implementation in other business units. Independent ERP systems in business units are connected only to share information in order to obtain a picture of the whole process and performances of the company.
- **Slam Dunk strategy** - involves the implementation of ERP systems only in the domain of key processes, where the ERP system adapts to existing processes, if necessary. It is a low risk implementation, because it usually does not perform significant re-engineering of business processes, but only introduces a new tool for their support. This is phase integration in vertical direction where the first implemented

modules are finance and control, and then sales, distribution, human resources and so on. This strategy is intended mainly to smaller companies, which want to apply ERP system quickly and avoid complex and costly reengineering processes.

Although ERP systems offer great potential benefits, their implementation can lead to large changes in organization business processes and carries many risks with it. Implementation of ERP systems is criticized as long (need 12-18 months for implementation, and 1-3 years for the actual transformation) and expensive (recent researches show that the average cost of ERP systems are about 15 million dollars, and reached up to 300 million dollars). In addition, the ERP is difficult to integrate with other solutions, and requires extensive user training. Not only it is necessary to install a large amount of hardware and software and connect them in a fairly invasive way, it is also necessary to train personnel for complex tasks of its usage and remodel some business processes in compliance with the concept of ERP [8].

The success key to the complex process of ERP system implementation is systematic and consistent phase approach taking into account the critical factors of implementation and a high level of planning and coordination.

VI. EVOLUTION OF ERP SYSTEM

The first phase of the ERP systems development was started in mid 70-ies with appearance of MRP systems (Material Requirements Planning systems). The basic processes of MRP systems have included production planning, purchasing and material planning. The next step was MRP II systems (Manufacturing Resource Planning systems) in mid-80s. MRP II systems were included, except manufacturing, development processes, marketing, finance, human resources and logistics. The modern ERP systems (Enterprise Resource Planning systems) have appeared in early 90's, as continued development of MRP II systems. These systems were based on Computer Integrated Manufacturing (CIM) and Electronic Data Processing (EDP). The biggest advantage of ERP systems was an opportunity to reduce costs and improve the dissemination of information throughout the company.

In order ERP systems to be called as software solutions, it is necessary to possess following characteristics at the same time:

- managing various activities of the company efficiently
- existence of common database
- ability to respond quickly at operational rules.

Beginning of the 21st century is characterized by the development of e-business and the Internet, and therefore more and more we talk about ERP II systems. ERP II systems, in comparison to traditional ERP systems, were improved with electronic business and other front-office

capabilities. These add-ons (extensions for ERP systems) include Advanced Planning and Scheduling - APS, Customer Relationship Management - CRM, Supply Chain Management – SCM, Business Intelligence – BI solutions and Partner Relationship Management - PRM. The main ERP modules in combination with these extensions became known as ERP II systems [9].

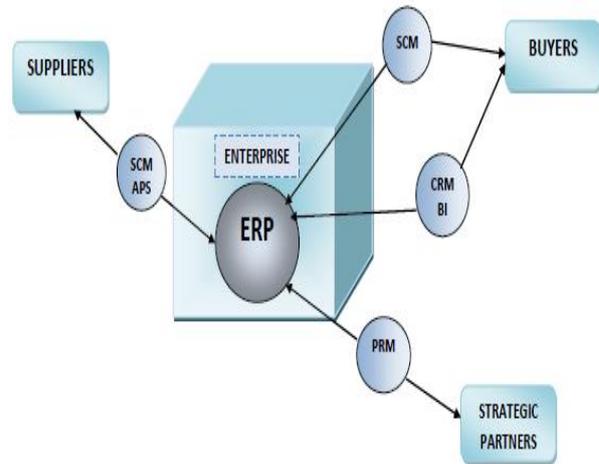


Figure 1. ERP II systems [10]

ERP II systems, as inheritors of traditional ERP systems nowadays are more than information systems. This is complete concept about how to manage all the information systems in the enterprise. ERP II system is value chain concept oriented to manage business processes and data in order to create value for customers and shareholders. These systems are based on Web and they allow employees, customers and suppliers "real-time" access to data in the system. ERP II systems represent improvement of ERP systems and the final phase in their evolution, so at the end of this paper, we decided to show comparison of ERP and ERP II systems.

TABLE III. COMPARISON OF ERP AND ERP II SYSTEMS [9]

	ERP systems	ERP II systems
Role	Enterprise optimization	Supply chain optimization
Domain	Manufacturing and distribution	All sectors/business segments
Function	Manufacturing, sales and distribution, finance processes	Cross-industry, industry sector and specific industry processes
Process	Internal, hidden	Externally connected
Architecture	Web-aware, closed, monolithic	Web-based, open, componentized
Data	Internally-generated and consumed	Internally and externally published and subscribed

VII. CONCLUSION

The aim of this paper was to define role of ERP systems in improving organization business. At beginning, we have introduced concept of ERP system, its main features and reasons why enterprises should accept these systems. Afterwards, we have tried to explain strategies for ERP implementation and point out numerous benefits, which ERP has brought to organization management. At the end, we have pay attention at ERP II systems, as inheritors of traditional ERP systems and final step their in development.

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Significance of CRM for Establishing Better Relations with Customers

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Abstract - In today's world there is an increasing number of organizations who have realized the importance of customer orientation. Need to increase profits, success in business and establishing better relationships with customers created CRM (Customer Relationship Management). The main goal of CRM is to gain and retain clients with the most purchasing potential. The role of CRM in organizations is to provide good information and thus enable interaction with profitable customers considering their needs. In this paper, we will try to point out the importance of CRM in the organization and establishing better relationships with customers.

I. INTRODUCTION

CRM (Customer Relationship Management) is defined differently in the papers of foreign and domestic authors, but it is perhaps the clearest and most succinct explanation given by Don Peppers, one of the greatest authorities in the field of CRM: CRM in four words: Treat different customers differently [1]. CRM is based on fact that customers are the most valuable assets of the company and researching their needs and wants is the starting point for the developing strategy of customer relationship management. Therefore, CRM is a business strategy aimed at collecting information to be used to increase customer satisfaction and loyalty, to the relationship with them was better, longer and more profitable. CRM philosophy must be present in all parts of the company and must change the internal value creation process [2]. The company that has embraced the philosophy of CRM, given the collected information, will go towards redefining their offers according to the needs of its customers.

Customer relationship management is a strategic approach made by creating improved relations in marketing channels through the development of appropriate relationships with key customers and customer segments [3]. In today's environment, this process involves the integrated performance of relationship marketing strategies and IT. The aim of this designed policy is to achieve long-term and profitable relationships with customers, but with all the partners with which the company works, as well as with groups with which the public has contact [4]. CRM is a modern enterprise approach focused on designing, developing and strengthening business relationships with companies carefully selected segments of consumers, to improve consumer value and profit, but also in general to

maximize the value for all stakeholders of the company [5].

CRM is a concept that focuses on how organizations can increase retention of profitable customers, while reducing costs and increasing the value of interaction and thereby maximizing profits. Companies whose successfully implement CRM will be able to increase the number of loyal customers and the rate of return, as well as a host of other benefits that derive from knowing the habits and needs of consumers.

By analyzing these and numerous other definitions, it can be said that the CRM is:

- **philosophy** oriented on each customer is treated individually and approached in a special way,
- **corporate strategy** focused on achieving total customer satisfaction and maintaining relationships with them,
- **an organizational culture** that creates a climate suitable for establishing a good relationship with customers,
- **set of methodologies** by which the company manages relationships with its customers,
- **set of software solutions** that provide technical and technological support for the management of customer relations.

II. FOCUS POINTS OF CRM

Focus points of users-oriented enterprises are leadership in product quality, optimization of production processes and closeness to customers.

When a company management firm decides for customer orientation and to begin to change management, the company is ready to implement CRM strategy, which is further based on a: professional staff, precisely defined procedures and the latest technology. Therefore, CRM involves a combination of people, processes and technology in order to understand the consumers of a particular company [6]. Each of these elements plays a crucial role in the implementation of CRM orientation and at least one of them is not persistent, the entire CRM structure will crumble.

The key is to find quality employees who possess certain technical skills and train them for a professional

relationship with our customers. CRM cannot implement successfully without the employees who are willing to invest large amounts of time and resources for its implementation. Employees must accept CRM as daily routine in their business environment, and to enhance the CRM initiative, it is necessary remodeling business processes. Business processes related to establishing and maintaining close relationships with customers are not cheap, so companies need to invest significant resources in the processes, equipment, staff training, etc. First, it introduces a quality system as a prerequisite for the implementation of information systems and modules for CRM. All participants in business processes must perform their activities in accordance with the quality system documents available to them through the information system. Operating procedures ensure that all transactions are carried on an efficient way, and thanks to them, the customer service representative can answer to any users questions.

The next step is the technology that will carry these improved processes and provide employees with access to the highest quality data, but also are easy to handle. Information technologies enable organizations to store, access, manipulate, and analyze large amounts of customer data. CRM applications based on information technologies allow companies: obtaining timely information related to the needs and wishes of customers, effective management of the acquired knowledge and create a mutually beneficial long-term relationships.

III. PERSONALIZATION OF RELATIONS WITH CUSTOMERS

In the last twenty years is the way in which companies look at their customers has changed dramatically. The main goal of the customer relationship management are gaining new customers, deepen relationships with existing and increasing the competitiveness and profitability of the company. To achieve these objectives it is necessary to personalize communications and business transactions with each individual customer. Personalization is achieved through the use of certain technologies that allow web server, based on data collected about the user, decide what suits his needs.

Unlike the traditional marketing, within CRM business philosophy, offer is personal, customized to individual needs. Marketing tries to operate under the principle of "one to one" by adapting to market segments. Thereby CRM is much more than software support for processes automation in marketing, sales, after-sales services and management, and is more of a set of methods to increase the efficiency of these processes. CRM for the company is to be well informed and be able to interact with profitable and potentially profitable customers, taking into account their individual needs.

Establishing and maintaining close relationships with customers requires significant resources need to be invested, so each company must determine the extent to which it will require to accommodate specific requirements of each customer and whether each client

needs to devote equal attention. The answer has a major impact on the future success or failure of the company, and in this connection it is necessary to identify profitable customers and the company's efforts to focus on them. It is necessary to understand what is most important to consumers, and how it is possible to make a profit from them, then we should work on gaining market share in the limited field [7].

TABLE I. COMPARATION OF TRADITIONAL MARKETING AND CUSTOMER RELATIONSHIP MARKETING

Traditional marketing	Customer relationship marketing
Focus on selling products	Focus on retaining customers
Short, discontinuous relationship	Long-term relationship, intensive interaction
Asking questions, resolving complaints	Building trust, excellent service
Limited customer trust	A high level of customer trust
For quality corresponds production function	For quality corresponds all the staff in organization

CRM provides customers with a feeling that the company treats them as a person - through personalized relationships and concerns, as the common people, who buy the products for personal use (Business-to-Customer, B2C), but also to other companies, which use this products to create their own profit (Business-to-Business, B2B). In order to achieve the desired personalization of relations, it is necessary to collect, enter in information system, process and store a certain amount of personal information about each customer.

One of the primary functions of CRM is collecting information on customers, so the company must consider the desire for privacy and security of data, as well as the legislative and cultural norms. It is essential that data be maximum protected from abuse, because only in this case, consumers will be willing to give the company the necessary information. Customers do not want to share their data with third parties without the prior consent and require that there are safeguards that would prevent illegal access by third parties. Therefore is best to send each customer a written company policy document on the protection of personal information of consumers, followed by an explanation how collected data be used and that none of the data will not be available to third parties. Companies today are investing a lot of effort to prove that their clients very seriously the problem of protecting data.

IV. CRM AS SOFTWARE SOLUTION

In essence, the structure of the CRM software solution consists of three components:

1. Operational CRM - automation in basic business processes (marketing, sales, service)
2. Analytical CRM - supports the analysis of consumer behavior

3. Collaborative CRM - provides contact with customers (phone, fax, email, web, SMS, personally).

These three components of the CRM concept support one another, and the result of a successful CRM integration of all three parts. **Operational CRM** is entering data on the interaction with the user, through a variety of databases and applications for tracking user activity. It provides support for business processes in marketing, sales, after-sales services and management, and enables them to automate and integrate. Any communication with the customer is included in his personnel file, and all the necessary information about the buyer can find mutual interactions of the database. This allows the organization to meet its sales processes, marketing and customer service to personal and efficient manner, creating a direct interaction with them by sending data.

Analytical CRM create and exploit knowledge about current and future customers to support business decision-making, business processes and strategy. The backbone of the analytical CRM are statistical models and mathematical analysis, which allow the prediction of customer behavior. Models using customer transaction data, demographic data, and data on customer requirements. Analytical CRM provides usability of information and a daily tool for all employees involved in the process-oriented consumers. Has a basis in detailed databases and objectives, understanding the behavior of consumers, providing the basis for decision-making in sales and marketing, to support the planning and optimization of operational processes.

Collaborative CRM enables enterprises, business partners and customers to work together in areas of marketing, sales and after-sales services. The function of collaborative CRM is to combine information gathered from a variety of departments in order to improve customer service and provide customers with a connection to all available channels of communication. Collaborative CRM applies to both traditional and newer technologies that enable communication between organizations and their business partners or customers. Examples of cooperation scenarios, supported by CRM software solutions, the processes of e-marketing, e-commerce and e-services based on the Internet, as well as managing sales channels and distributed by ordering [8].

V. DATABASE AND CRM SOFTWARE

CRM concept was based on the presumption, that if you own right information about the customer, available at the right time and right place, product sales will be much more successful and the customer will be satisfied. Informatization of processes for managing customer relationships begins with creating databases. Database is an organized collection of data, which can easier locate and identify a problem or analyze a particular condition. Modern marketing customer service is almost unthinkable without a comprehensive database, and one of the goals of CRM is to transform valuable data about

customers into knowledge about them. This knowledge needs to be written and stored in databases, accessible and open to analysis. The database is mine of valuable, reliable and specific information about customers. The databases of customers can be grouped by product/service, geographic coverage, location, frequency of contact, so the customer category. Adequate database improves communication and marketing towards full satisfaction of customer needs.

Marketing databases based on a careful and precise use of information on current and potential customers, competition and internal corporate information stored in a computer database with a focus on marketing activities aimed at target markets [9]. CRM software includes a full range of data and information from various sources related to professional customers, the clients, customers and other users, it is about references, attitudes and expectations of customers, volume and dynamics of shopping, history, relationships with customers, the value of each customer, evaluation of customer satisfaction, etc. [10].

VI. INTEGRATION OF CRM SOFTWARE SOLUTION

In the past, CRM software solutions for a generalized application direct contact with consumers, but over time it became clear that a successful CRM solution must meet the following basic requirements [8]:

- integration with other applications in the enterprise, such as ERP, SCM, etc.
- focus on needs of end users
- support for cooperation between companies
- comply with the specific needs of particular industries.

The request for the comprehensive management of customer relations is guide by the need to integrate digital technologies in order to come to a complete insight into the characteristics of consumers and insight into the history of their relationship with the company. Four technologies that need to integrate for company CRM maximum benefits are [11]:

- **inherited or traditional systems** (must be integrated into the new CRM infrastructure to maximize the extraction of data from these systems)
- **CTI or Computer Telephone Integration** (enables call handling, where timely information about the caller associated with customer information, stored in a computer database)
- **Data Warehouse** (allows extraction of data from transactional systems company with the ability to effectively analyze and systematize)
- **tools for decision support** (help in decision making with regard to their needs, based on data on customer relations).

CRM infrastructure alone is not enough. How this concept be more accepted by the company, consumers will require expanded support capabilities that can come from the company's integrated CRM system. Using of innovative solutions enterprises can integrate customers, partners and suppliers in a virtual network that is oriented towards the user. The current trend is moving towards the development of integrated solutions, which are a combination of specialized management software, such as:

- **CRM** – Customer Relationship Management
- **SRM** – Supplier Relationship Management
- **PRM** – Partner Relationship Management
- **ERM** – Employee Relationship Management.

These solutions, combined with powerful ERP (Enterprise Resource Planning) and SCM (Supply Chain Management) systems, enable that value optimization bring by business processes between companies, associates and employees, be set in center of enterprise business strategy.

VII. E-CRM AS AN IMPROVEMENT OF CRM

Customer relationship management reached its peak with development of the Internet, which has enabled customer personalization by direct contact, database creation and monitoring their activities. Internet includes new models of mediation between the company and the customer, enabling organization to adopt CRM and focus on effective customer relationship management, and the use of online applications to improve those relations. Within the websites, specialized statistical software packages enable monitoring and collecting answers to various questions that can be stored in the appropriate database. This way can keep track of the customer habits and their specific interest.

Electronic customer relationship management (e-CRM) can be defined as the activity of customer relationship management using the Internet, web browsers or other electronic methods. One reason for the popularity of e-CRM in today its highly interactive nature, which allows organizations to directly respond to the demands and concerns customer and establish and maintain long-term relationships with them. Information technology helps the organization to differentiate customers and to address personal messages, create personalized Web sites, which enables identification of customer and display their preferences, and to create customized products or services. E-CRM is an extension of the concept of CRM, where users themselves determine which content they want to see, no time limit, and the more freedom when buying because there are no intermediaries. E-CRM is an integrated CRM web that involves the integration of multiple channels of access points over the web, characterized by greater interactivity, technology and its architecture is different from the traditional CRM.

From the perspective of CRM, it is a means to interact with the customer, which brings a number of advantages for the organization. It reduces costs, expands the market and increases the quality of service. It also increases the value of customer relationships at certain levels such as access, convenience and low cost. E-CRM provides organizations the means for the implementation of interactive, personalized and relevant communication with customers via electronic and traditional channels and over. The focus is on understanding how the economy affects customer relationships in business.

Possibilities of e-CRM are great, but they are also significant challenges faced by organizations using it to help building long-term relationships with their customers. Building trust between seller and buyer is one of the key challenges of e-CRM as the traditional builds trust through personal relationships and building trust at a distance is difficult. Great competition, which allows Internet transparency, represents another challenge for e-CRM, because it is very difficult at the time when the other competitors are "one click" away. Most Internet users compare different offers so that exposure of targeted customer to messages and offers of competitors is inevitable.

The introduction of e-CRM is a long process for which we will never be able to say that it is completely finished. User requirements are increasing in parallel with the growth of technology capability and awareness of the customer, who is the most important link in the chain, should permanently maintain at the highest level.

TABLE II. COMPARATION OF CRM AND E-CRM

	CRM	E-CRM
Processes	customer behavior is difficult to predict	transparency in customer communication
	low automation interaction	high automation interaction
	"time-delayed"	"real-time"
Chanel	"face-to-face"	web site
	telephone	e-mail
	mail	wap

VIII. BENEFITS AND LIMITATIONS OF CRM CONCEPT

In today's world there is an increasing number of organizations have realized the importance of orientation to customers and invest large amounts of time and money in the CRM system in order to establish better relations with customers. Organizations that are willing to implement CRM solutions have become very competitive and constantly perform differentiation relative to its competitors. CRM is a relatively new concept, which is due to changes in management, strategic planning and personalized service consumers, growing more and more. It includes features, tools, and technology that allows the

company to operate through improved customer relationships, and its purpose is to facilitate the effective and efficient achievement of company goals through understanding of consumer needs. Implementation of CRM system is a complex, time consuming and expensive process that requires expertise. For this purpose, it is necessary building the platform for communication with consumers and collecting and analyzing relevant information from them.

The main goals of modern customer relationship management are gaining new customers, deepen relationships with existing and increasing competitiveness and profitability of the company, but also reducing service cost, improving productivity and customer services, entering new markets, analyzing competition, open access and consistent exchange information in company.

Customer relationship management provides a number of potential benefits for the organization [12]:

- **complete understanding of the customer objectives and requirements**
- **customer involvement in process of defining offers** which improve organization's ability to learn and innovate
- **reducing conflicts**
- **increase of customer's costs** for moving from one supplier to another
- **better relationship management and stronger relationships**
- **increase of competitiveness** at the rest of the market
- **better internal communication and business planning.**

It was found that the companies that have developed the concept of CRM:

- grow almost 60% faster than the competition without CRM
- expand market share by 6% a year
- charge 10% more for their products
- achieve return on investment (ROI) of 12%
- increase customer loyalty by 5% can increase profits by 25% - 85%.

The survey conducted in 2006. in the EU confirmed that companies without CRM [13]:

- on average lose 50% of their customers every five years
- approximately 65% of lost customers leaving because of poor service and communication
- acquiring a new customer costs five times higher than the cost of retaining the old

- an average dissatisfied customer will inform its bad experience with 8-10 people, and 12 of the 15 most frequently cited causes of customer dissatisfaction are related to poor service (busy phone lines, no response to e-mail, etc.)
- 70% of customers who were unhappy with the buying, will buy again, if the cause of their dissatisfaction quickly rectified.

Despite the promising potential of the CRM concept as a way of establishing comparative advantages, the percentage of failures undertaken implementation is relatively high, causing increased concern for business organizations. A recent survey showed that 70% of companies that have implemented CRM, had disappointing experiences, the principle easy to do wrong, hard to do right. 202 CRM research project, it was found that only 30.7% of knowledgeable organizations achieve improvements in the way they sell their products and services to customers [14].

Among the main causes of CRM systems failure are [15]: organizational change (29%), organization policy - inertia (22%), poor understanding of CRM systems (20%), underdeveloped and small CRM skills (6%).

As the obstacles to success of CRM systems highlights the following [5]:

- **lack of skills** in the creation and use of new e-CRM system as the main obstacle to the implementation of CRM systems
- **inadequate research** that does not meet the requirements of CRM systems in terms of cost and scope of research
- **poor quality and quantity of information** is a key issue for organizations in the early stages of CRM systems
- **lack of managerial understanding** of the benefits provided by the database
- **functional limitations** in terms of lack of cooperation and managerial communication with different business functions
- **lack of leadership and involvement of senior management** in CRM activities
- **inadequate assessment systems** which slow down the implementation of CRM projects.

As one can deduce from foregoing, the implementation of a CRM system is viewed as a risky process because of failed projects that give this concept a bad reputation. The most common reason is that the decay organizations view CRM only as a technology and software solutions, and technology alone cannot build a profitable customer relationships. Implementation of CRM strategy actually requires a complete redefinition of processes in the company, with the precise integration of marketing management, communications, and information technology.

IX. CONCLUSION

The aim of this paper was to define the concept of CRM and its focus points, as well as to explain CRM software solution and highlight the importance of this concept in developing close relationships with businesses customers. We also wanted to point out the numerous advantages and limitations arising from the implementation of CRM in modern enterprises.

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Bayesian-GA Reasoning Risk Management for a Company Restructuring Project

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Abstract – Risk management is process of identifying evaluating and prioritizing the risk. The task of risk managers is to create a plan to reduce or eliminate risk. The strategies that are applied are diverse and depend on the type of risk and the type of business. Business of modern organizations and companies all over the world is enforced to adapt to constant and progressive changes in almost all segments of life and work. Such a state-of-the-art arise many questions concerning the existing social trends, especially macroeconomic field. The paper presents mathematical models implemented in the form of a system for decision support in risk management, and in order to answer the question "What is the probability that the project succeeds?"

I. INTRODUCTION

Environmental changes arised primarily under the influence of modern scientific-technological progress in the field of informatics, energy, new technology and communications, have a direct impact on any enterprise. We can't speak about long-term stable conditions for a company's business but only about conditions of continuous changes. In the conditions when some branches of mass production stagnate or decay along with the development of new branches, need for traditional (functional) organizations is changed by the need for organizing people in target oriented (project) groups. Basic features of these project groups are reflected through clearly defined objectives, management decentralization and business process control. The main task of these groups is to resolve certain problems faced by the company.

Risk management company may increase its value. Risk management is a continual process that seeks to apply the appropriate tools, procedures and methodologies to avoid that risk or to keep within certain limits.

The paper advances the currently available formal models of risk management through the implementation of the system done in C#. Risk management is applied in order to protect the company from losses. The focus is on maintaining and reducing financial risks. But risk management is used to protect employees, customers and the general public from adverse events [1].

The problem is to choose actions to reduce the risk so that the total expected costs minimized. It is particularly difficult to do for larger projects. Solutions can be found using various optimization techniques. There are two main groups: gradient based optimization techniques and stochastic or guided search techniques without gradient

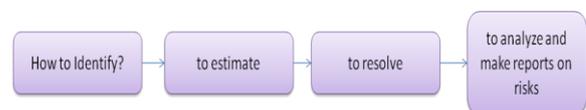
utilization. Due to the genetic algorithm properties such as strong nonlinearity, complexity and large scale of integration, it can be considered as an appropriate technique for the economic optimization of project risk management. The aim of this paper is to present a mathematical model and application of Bayesian network and genetic algorithms to the specific issue of risk management.

Paper is organized in six sections including Section 1. Section 2. is an introduction to a risk management. Section 3. and Section 4. briefly summarize Bayesian network and Mathematical model. In Section 5. an application of proposed Bayesian-GA risk management approach is made on a project of Serbian Postal company restructuring. Finally, in Section 5. conclude this paper.

II. RISK MANAGEMENT

Risk management is the process of identifying, evaluating and prioritizing the risk. The task of risk managers is to create a plan to reduce or eliminate risk. The strategies that are applied are diverse and depend on a risk and business type.. There are several standards for risk management, including those developed by the Project Management Institute, International Organization for Standardization (ISO), National Institute of Science and Technology and the Actuarial Societies.

There are four elements important for Risk management:



When all potential causes of loss are identified and reconciled, it is necessary to develop and implement plans to deal with potential losses before they occur. In order for this task to be done, it is necessary to be familiar with the alternative methods of the prevention of risks and the probabilities of possible loss. Establishing a continuous process of risk control means that we should make a continuous system for identifying risks and developing strategies for responding to potential risks. It is necessary to make continual adjustments of planned strategies to new conditions in order to reduce a possible risk of adverse events and possible losses of efforts and actions of risk events. The process control is the monitoring of business processes and developing of different events and the constant changing and adjusting

of the planned actions and strategies to those new situations.

III. BAYESIAN NETWORK

In this paper Bayesian approach is proposed. The reason for choosing this approach is an accurate answer although all data are not always available. It is convenient for risk analysis, support for decision analysis and fast response. Bayes is used in different diagnosis, prediction and control output.

Uncertain events are represented with nodes, nodes from series of branches, and at the end probability tree is formed. From every node number of started branches depends of possible outcomes of uncertain events. Branches that contain more than one node represent logical conjunctions of number of possibilities as the number of nodes. Each branch has associated probabilities of logical conjunctions of possibilities that are derived by multiple rule. The probability of each event is calculated as a sum of probabilities of all branches that are connected to it, and the sum of probabilities of all branches is one.

Variables $X_i, i = 1, \dots, n$ given $\pi(X_i)$ are conditionally independent on all non-parents nodes, a joint distribution probability of n variables can be decomposed according to a chain rule as:

$$P(X_1, \dots, X_n) = \prod_{i=1}^n P(X_i | X_1, \dots, X_{i-1}) = \prod_{i=1}^n P(X_i | \pi(X_i))$$

The preprocessing steps of a risk identification, risk analysis and risk management are required in order to build the Bayesian network model of a risk management[2].

Bayesians models are different from frequentist models. Frequentist models do not use distributions for presentation of model parameters. Their models make calculations only with probabilities of random data.

Bayesian approach allows existence of data peeks which is also the advantage of this model. Process of risk assessment can be performed using Bayesian methods. Obtained results by Bayesian approach are useful for analysts and decision makers. Bayesian approach considers subjective information and personal opinions of experts. On that way analyst includes subjective attitude into objective equations. This feature is very interesting and useful for analysts, because they mostly work with subjective information and data.

Another and perhaps the most important advantage of Bayesian approach is that they always derive some result and an answer. Frequentist methods do not work in every situations. For example Bayesian model gives answers where there is no available data. Specifically, they can produce answers even when there is no sample data at all. They use the unmodified prior as the posterior. Because there are no data, the application of Bayes' rule would not alter the prior. In this sense, the initial prior is the zeroth posterior.

IV. MATHEMATICAL MODEL

Mathematical model reduces risk by using economically optimal combination of activities. Input data are the elements of work, the elements of risk and a set of possible actions able to reduce the potential risk.

The set of elements of work is marked with $W = (w_1, \dots, w_w)$. A set of risk events $P = (p_1, \dots, p_p)$. A set of three attributes characterizes each event: the internal or external source, the probability of occurrence, and an impact. The set of sources is marked with $C = (c_1, \dots, c_c)$. Each event has a source of risk, but the source of risk can be generated with several other risk events. The matrix elements M represents monetary losses of some event caused by the risk with probability p . The set of actions for reducing the risk will be commemorate with $A = (a_1, \dots, a_a)$. And with X we will mark the selection matrix, where $x_a = 1$ if the action is selected and $x_a = 0$ otherwise. The abatement action cost is denoted by c_a . The effect factor of action a on the probability of risk r originated from work element w is $v_{r,w} = (v_{r,w,1}, \dots, v_{r,w,A})$. The effect of action a on the impact of risk r originated from risk source s is $u_{r,s} = (u_{r,s,1}, \dots, u_{r,s,A})$. If an effect attribute is 0 it has no effect. $X_{(A \times A)}$ is the diagonal matrix with $x_{a,a} = 1$ if the action a is chosen and 0 otherwise. $Xv_{r,w}$ is the resulted probability vector with the chosen actions, and $Xu_{r,s}$ the impact effect vector with the chosen actions. The modified probability of risk event r from source w is given by $f(p_{r,w}, Xv_{r,w})$. The modified impact of the risk event r from source s is given by $h(m_{r,s}, Xu_{r,s})$. f and h are functions of arity $A+1$. A risk abatement action cannot affect the probability of a risk event that originates from external sources, but it can affect its impact.

The total expected costs (TEC), which are risk related, consists of two components: abatement actions costs (AAC), and expected risk loss (ERL):

$$AAC(X) = \sum_{a=1}^A c_a X_{a,a}$$

where c is a row vector of c_a is a column vector of appropriate size of 1's. If no abatement action is chosen:

$$ERL = \sum_{r=1}^R (\sum_{s=1}^S p_{r,s}) (\sum_{w=1}^W m_{r,w})$$

If some action have been selected, the expected risk loss becomes:

$$ERL(X) = \sum_{r=1}^R (\sum_{s=w+1}^S p_{r,s} + \sum_{s=1}^w f(p_{r,w}, Xv_{r,w})) (\sum_{w=1}^W h(m_{r,s}, Xu_{r,s}))$$

Meaning that f is the product of its $(A+1)$ non-zero arguments and h is the minimum of its $(A+1)$ non-zero arguments. The general risk management problem can be expressed as: minimize $TEC(X) = AAC(X) + ERL(X)$. The model allows two types of pairwise constraints: exclusion and implication. The first is defined by $q_{i,j} = 1$ if actions i and j exclude each other, and $b_{i,j} = 1$ if selection of action i implies selection of action j , and 0 otherwise. The conditions can be expressed as follows:

$$\begin{aligned} X_i, i \leq X_j, j, \forall b_i, j=1, i, j \in A \\ X_i, i \rightarrow X_j, j \leq 1, \forall q_i, j=1, i, j \in A \\ X_i, i \in 0, 1, \forall i \in A \end{aligned}$$

V. BAYESIAN-GA APPLICATION OF PROPOSED APPROACH FOR A POSTAL COMPANY RESTRUCTURING PROJECT

Bayes network represents a graphical model whose elements are nodes, the arrows between nodes and connection probability of two nodes. In mathematics, the formalization of this model is called a directed graph. If there is a arrow from node X to Y it is said that X is the parent of node Y, and Y is a child of node X. Bayes networks provide a compact representation of relations between the parameters involved. A key feature of Bayesian networks is the possibility to provide a method of decomposing the joint probability of variables in the set of local distributions. This facilitates the examination of relations among variables in a given problem.

The genetic algorithm searches stochastically and therefore is used with the search of the extremum of space of large dimensions. Applying the mechanisms of genetic algorithms, information of these local extremes are exchanged, and the aim of the algorithms is not to be finished in one of them, but to recognize among them the one who is also global at the same time. Exactly these qualities of genetic algorithm are the reason why this method is used in the paper. Risk management often involves large projects. The fundamental operators of GAs are:

- (a) the selection and reproduction of better individuals;
- (b) genetic recombination (crossovers);
- (c) the random mutation of individuals genes.

Selection is a fundamental operation which is performed with the aid of a function for the evaluation of the fitness of individuals. The straightforward duplication of selected individuals, reproducing them identical to those of the previous population, entails no benefit in terms of the exploration of solution spaces.

The recombination of genes can be accompanied by the operation of mutation, which has a very low probability, so as not to destroy entirely the genetic heritage accumulated through previous selections. Performed in this way, mutation makes it possible to enrich the variety of individuals present in the population, preventing them from tending to be too uniform, hence losing the capacity to evolve [3].

The fitness function is designed to evaluate the performance of the individuals (ex: functions) who make up the populations, transforming the fitness of the solutions proposed by the GAs into numeric values based on their performance. The typical steps into which a GA procedure proceeds are:

- (a) the initial population of individuals (or genomes) is generated randomly (by random numbers, binary strings of zeroes and ones are generated, all with the same length);
- (b) for every individual, fitness is calculated in relation to the problem that has to be solved (i.e., the goodness of the hypothetical solutions);
- (c) the degree of homogeneity of the entire populations fitness is calculated (bias);

(d) individuals are ordered on the basis of their fitness and those suitable to generate the subsequent population are selected;

(e) the successive population is generated on the basis of reproduction of new individuals, starting from the ones selected in the previous population;

(f) in the new population, the sequence is repeated from point (b) onwards.

We applied the GA technique to insolvency risk analysis. In the model, GA is applied on the selection of action for the reduce of risk. The main system GA contains three subfunctions that are defined below:

/******

ACTIONS EVALUATION

P := initialize(μ)

P* := P

while not terminate(P, evaluate(P), θ_i)

let P' = recombine(P, θ_r)

let P'' = mutate(P', θ_m)

let F = evaluate(P'')

P := select(P'', F, μ , θ_s)

if evaluate(P) < evaluate (P*)

then P* := P

end while

*****/

When the algorithm terminates, the variable P* gives the best population and the objective function was minimized.

We applied the Bayesian-GA technique to insolvency risk analysis. In the model, GA is applied on the selection of action for the reduce of risk. Bayesian network is applied on the determining the probability matrix P.

Model used to calculate the probability was carried out in the Bayesian model is:

For variables X_i ($i=1, \dots, n$) given $\pi(X_i)$, X_i is conditionally independent on all non-parents nodes, a joint distribution probability of n variables can be decomposed according to a chain rule as shown in

$$P(X_1, \dots, X_n) = \prod_{i=1}^n P(X_i | X_1, \dots, X_{i-1}) = \prod_{i=1}^n P(X_i | \pi(X_i))$$

Let X and Y be two stochastic variables, and suppose that evidences are $X = x$ and $Y = y$. Before considering the evidence $Y = y$, the prior probability of the event $X = x$ or $P(X = x)$ should be estimated first. After taking into account of the evidence $Y = y$, according to Bayes theorem, the posterior probability $P(X = x | Y = y)$ can be calculated as

$$P(X = x | Y = y) = P(X = x, Y = y) / P(Y = y) = P(X = x) P(Y = y | X = x) / P(Y = y)$$

Where $P(X=x|Y=y)$ is the probability of the joint event $P(X=x$ and $Y=y)$. If X, Y are independent, then $P(X=x|Y=y) = P(X=x)$. In this section applied proposed approach on a project of Serbian postal company restructuring. Project is divided into two phases. Following table contains all planned project activities within each particular project phase.

Mathematical model with genetic algorithm and Bayesian network is implemented in software, done in C#. Figure 1 represents the values of the objective function (total

expected costs) obtained during the optimization run. The first 15 generations were not taken into account, therefore they are not presented on the graph. As can be seen, after about 20 generations, a good value was found, and the next searches decreased it lightly [4]. In this case, the values of the objective function are:

AAC = 660000, ERL = 219000.08, TEC = 879000.08.

TABLE I. SERBIAN POSTAL COMPANY RESTRUCTURING PROJECT

No.	Phase-activity
1	Restructuring strategy developing
1.1	Current state analysis
1.2	Analysis of International experience in postal industry
1.3	Institutional conditions for Serbian postal company restructuring
1.4	Scenario for Serbian postal company restructuring
1.5	Program for Serbian postal company restructuring
2	Restructuring strategy implementation
2.1	Planning of strategy implementation
2.2	Documentation creating and adoption
2.3	Personnel training
2.4	Restructuring strategy implementation
2.5	Monitoring of restructuring strategy Implementation

VI. CONCLUSION

In modern business environment when enterprises are exposed to permanent changes, theory of management gain a new dimension in management, which is reflected through development and implementation of a new concept in enterprise managing. Unlike the classical functional approaches, the need for managing throughout overall business of an enterprise by managing of projects is more imposed, where such access is called project access to enterprise management. In this way the project is becoming a basic tool for solving all possible problems that one enterprise can encounter.

Risk management is a complex area. In this paper we presented an Bayesian-GA Reasoning Risk Management for a Company Restructuring project. Proposed approach has been applied on a project of Serbian postal company restructuring. Obtained results appeared as very consistent.

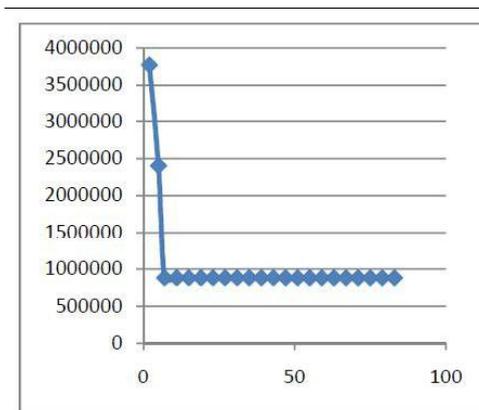


Figure 1. An optimization run

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The Importance and Benefits of Internet Marketing

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Abstract - Internet marketing is the use of general search and representation on the Internet for commercial purposes. Presenting an advertisement on the Internet that has a significant difference in all aspects of advertising in comparison to the standard advertising. The Internet has created a virtual global marketplace and unlimited in time and space. Contributed to a change of form of marketing, from traditional (mass) to the "average consumer" and his custom marketing instruments in the marketing mix, in an individualized, custom (customized), target (one to one) marketing. The new form of marketing is focused on individualized internet consumers through direct interaction. Instead of mass marketing on the internet marketing mass produced individuals, and advertising shifts in the choice of information. Commonly is defined as meeting the needs and demands of consumers for information, products or services, with adequate financial compensation. Precondition for a successful implementation of online marketing is the knowledge of basic systems and processes of marketing. This includes knowledge of marketing research, planning and product development, distribution and promotion as well as marketing activities and marketing tools.

I. INTRODUCTION

With the advent of new technologies such as the Internet, there are also new ways of communication and promotion of the company is increasingly used. In addition to print media, radio and television, the performance of companies on the Internet performs the communication with customers, product promotion, which has developed a new area of the marketing mix, is called internet marketing.

Marketing communications in a digital world focused on creating a presence, create relationships and create mutual value. Internet as a marketing channel is interactive, accessible, affordable, interesting and integrates all elements of marketing. As a channel, internet users and sends the information as a guide / portal to other channels that have the information. The potential for building relationships with customers is present in all parts of marketing. Marketers no longer have to assume that the customers can now find out the full profile. Insight into the benefits of Internet marketing

strategy gives the opportunity to improve marketing communications.

II. INTERNET MARKETING

Internet marketing can be represented as a process of planning and executing the conception, price, promotion, distribution of ideas, goods and services, provided suiting communication aspects of the Internet, in order to create exchanges that satisfy the objectives of consumers, businesses and society [3].

The presence of companies on the Internet is not a brochure or advertising flyer in which owners proud. Quality Global presence in the network to take all necessary steps to give meaning, relatively presentation is a dimension that brings business and that is why it exists – profit [2].

The combination of large number with different marketing strategies that results in at least 10 times higher than their price. Quality selection and integration of these strategies should be given a higher score than their simple sum (synergy).

Internet marketing activities should start with the creation of a meticulously planned and executed marketing strategy that takes your offline and online marketing activities into consideration. We examine your current web presence and based on its effectiveness, we propose an Internet marketing strategy that integrates with your overall marketing with a focus on online marketing.

And, before we start actual marketing activities, we analyze establish baseline statistics for your website such as traffic details, traffic sources, website content, keywords, bounce rates, search engine rank and more. This data is used to benchmark the effectiveness of your Internet marketing.

Your overall Internet marketing strategy will depend, in large part, on answers to the above questions. We will work with you to help you properly answer the above questions, and then to formulate your internet marketing plan if you do not already have a website.

Multiplier concept formation firm presence on the Internet is based on the recognition of users' needs [6]:

- What is it that distinguishes your company from the competition?
- Who are the potential customers?
- What information is needed for potential customers?
- Who are your achieved (regular) clients and what they can offer over the Internet?
- What are the characteristics of the products, services and their distribution?
- In what ways can reduce the different costs of communication over the Internet?
- What is your offer?
- What Internet services used in different stages of Internet presence?



Figure1. Communication and businesses today have no boundaries [4]

III. INTERNET MARKETING PRINCIPLES

Visitors to the web site they are interested in useful information, especially if they are able to answer their questions and meet their specific needs. Also attracted by the opportunity to receive a gift, to get some valuable information for free or the free entertainment, and this is often the main reason they will visit some websites. Such websites have a greater chance of being selected in the thematic catalog to be well evaluated in discussion groups.

Important aspects of the marketing of building Web sites are:

- Creating a Web-interest analysis must precede the foreseeable visitors, because of the satisfaction of that interest will depend on the success of Web
- Web space replaces expensive phone call centers
- Web space, can provide a personalized service, because the user can specify that your profile their specific interest in information
- It is important to motivate visitors to re-visit Web site
- It is important to allow the user presentation and association with complementary institutions, and for the efficient completion of the whole work
- They need to be available addresses of companies from the same area of activity
- User communications with the company should be such that the user of the shorter waits for a response.
- The presentation should include an annual operating results, reference list, etc..
- Many customers use the Internet as a tool for information, find and select products, then do some ordering of the traditional methods, so it is important to enable them to order a product in a way that suits them (e-mail, Web form, a shopping card, fax and telephone).

IV. IMPORTANCE OF INTERNET MARKETING

Starting with papers, present world is now based on digital applications. Organizations and customers, both are now equipped with computers and PDAs powered by high speed internet service. This technology change had created new gateways of one-to-one relations and mass population reach. This mutual benefit boomed internet marketing in 21st century.

Internet marketing covers all terms used for marketing a product or service on Internet. This can be done through traditional banner, video or textual ads or by strategic moves like SEO, SMM, SEM or Emailing. The aim behind it may be to generate revenue or maintain customer's relation or loyalty. Every competitor chooses same ways. So to be on top, organizations have to employ strategies and keep themselves ready adopt new options of marketing over internet.

Importance of Internet Marketing is now expanding, since the aim of every business starts and ends with these three purpose of generating revenue, maintaining customer relation and increasing customer's loyalty. The most valuable importance of internet marketing is its reach ability of internet around the globe and its mass appeal. No other traditional media such as print and broadcasting can reach that number of population and if does that, it can't attain that pace of reach.

Internet marketing's importance include flexibility, measurability and affordability. Importance of Internet marketing also lies in its interactive nature. Now organizations can easily track their customers and reach them, whereas customers can now evaluate and compare their product and services more efficiently. Internet marketing has enabled organizations to easily imprint their marketing options and quickly change their tactics and cost allocations towards a valuable marketing strategy. Through Internet marketing, targeting is possible with accuracy and efficiency. It gives you options to target customers with various available choices mainly depending upon their demographic, age, interests, needs, etc.

Today, organizations are aware of internet marketing importance and are regularly competing. To overcome this competition, professionals are regularly researching and innovating new tools and tricks to enhance the power of Internet marketing. Importance of anything cannot be ignored and an organization knows that well. Internet marketing is regularly becoming fast and efficient with the involvement of low cost and high reach. These all attract businesses to promote their product and services over this World Wide Web where customers are always online. Now they just have to deliver their message to them. [8]

V. ADVANTAGES OF INTERNET MARKETING I.

The development of the Internet, especially Web-enabled a significantly reduced cost of marketing, its global reaches the use of multimedia and improved communication with customers in a way, almost all of the internet marketing. It has provided new opportunities for market research, new models of electronic marketing and improved decision support customers. In addition to all the Web sites have more or less a marketing function, on the Internet and there are very specific opportunities for advertising and promotion. Company web sites provide detailed information on the products and services the company offers, allow visitors to ask questions about products and services, buying products, learning about how the product is used and the solution of problems related to the purchased product.

At relatively low cost, the Internet is a highly effective direct marketing tool. Capabilities of the Internet as a sales channel are limited, for the most part, the specific characteristics of the product being sold. Internet business plan today offers new ways of communicating with the market.

The advantage of the constant availability of Internet service allows users to choose when to access the Web site, and for example, in a television airtime. This is not trivial, because when the user decides to visit a particular site, there is likely to be easier to accept the information, not just the ones I requested, but the ones that he is running there.

On the Web can be always new information, because the pages always are refreshed. It can be a big advantage over some traditional marketing tools and traditional media (catalogs, TV commercials, ads in newspapers and the like.), because they must prepare and make, and timing of the publication was affected by. On the Web, there is a possibility of dual communication with customers, as opposed to the mass media to operate on a system-many, for example. Their television broadcasts thousands of spectators at a certain time without the possibility of two-way communication in most facilities. Although today's most visited Web sites are increasingly working on one-to many-'s it can send an email or fill out the questionnaire.

Which the user answers a question e-mail not only to get a response, but the information that is held and a website, which means that they will be able to continue to find something and ask questions, and thus will also acquire and the feeling that someone cares about their needs. It is one of the ways and means of building customer loyalty, good image and company name, and thus ensures a site visit.

Three Benefits of Internet Marketing - That's where building and internet marketing strategy becomes important. And, there are at least three strategic benefits of carefully building and nurturing your company's position online:

- **Expand Visibility:** Because the stage for marketing your business is immense an internet marketing strategy elevates your platform above others. It makes it possible for people to see and find your business easier, and this is especially true in a noisy business environment.
- **Increases Amplification:** Traditional marketing strategies create a whisper in the marketplace of ideas, but an internet marketing strategy increases the volume and frequency of your message. Today modern media — social media included — provide a platform and the acoustics you need to be heard.
- **Build More Connections Faster:** Traditional media has given us a way to talk to clients and prospects, but an internet marketing strategy opens up opportunities for engagement — two-way communication that builds intimacy and deeper relationships that last longer and become more profitable. Not just for you, but for them too.

VI. ESSENTIAL TECHNIQUES IMPLEMENTATION INTERNET MARKETING

A. E-mail

The advantage of e-mail marketing is the shortest in the fact that it is a direct communication with the user of the product or service (direct marketing). Another advantage of making e-mailing list is that they all signed people who are interested in receiving information offered. Besides e-mail list should be used to maintain good relationships with employees, customers, business partners, and media.

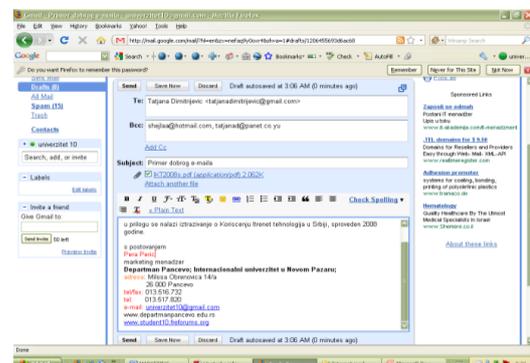


Figure 2 Implementation of a well-designed e-mail signatures [7]

What we provide web and e-mail, the internet are unlimited opportunities related to teaching potential clients about a product or service, providing news related to the subject matter of its occupation, providing news on new products, affirmative action, to lead a discussion on

the topic that is of interest acting company. To meet the culture of communication on the Internet all of these activities can be carried out only in the case when the user wants information. This is achieved by a presentation on the form is where the user logs in your e-mail address that will be getting a circular post (mailing list).

B. Newsletter, e-books and other online advertising technology

Once a week, a month or a year, depending on the dynamics of changes in the company it is desirable to send e-mail to all existing and potential users of the product or services as well as business partners, and with news that inform registered on the mailing list of updates in business , holiday greetings or personal state.

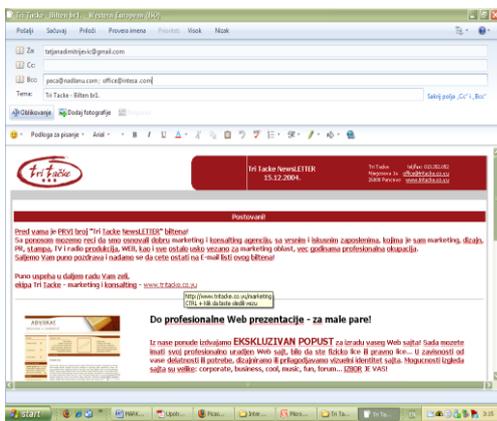


Figure 3 Newsletter [10]

C. Banners

Banner or Ad (Advertising) the English word for a picture that represents an ad for a product or service and that there is a page of a site (and Banner Ad expressions are often used words that have the same meaning and proper to say "banner ad "). Banner can be stationary or animated (one or more images into a single image), with the accompanying text or images outside without it. . Companies advertising through banners can be made - the exchange banners with friendly Web sites, placing banners on portals which offer this service free of charge, ii posting on sites with financial a fee.



Figure 4. Banners [11]

D. Social media

Social media (Social Media) is a free web service that, through communication, linking technology and social interaction [1]. What characterizes social media in relation to the other is the possibility of two-way communication between advertisers and users. As such, they constitute a separate brand and assist in the dissemination of marketing messages in a relaxed and accessible manner.

Social Media Marketing can be viewed from three main aspects [5]:

- Create content that attracts attention and has become popular due to the wider audience that it was an original. Unlike traditional methods of conveying messages such content much more quickly multiply and spread among the users.
- Allows users to spread the content among them using certain web services. For example, fan pages on Facebook, MySpace and Twitter following this model.
- It is based on online communication. Social Media Marketing is not controlled by the organizations themselves. It encourages users to participate in the dialogue. Poor organized campaign using social media marketing company that can backfire. Successful campaigns must fully involve users and to respect the maximum.

Division of Social Media:

- Internet forums are a community of users who discuss certain topics.
- Blogs are Web sites that allow users to quickly and easily create and publish new content, share opinions and discuss various topics in the form of online diary and readers to post comments on the content and the comments of other users and readers. Examples are Word Press, Blogger, Tumblr, news Posterous. Social (Social News Sites) are websites where people share the latest news and information. Examples include Digg, Reddit, and Sphinn intended solely Internet marketers.
- Social tagging or "bookmarking" (social bookmarking) is similar to the social news except that the content does not have to be new and fresh. People can indicate the web, blogs, video, audio and other Internet content and share them with your friends. Examples include Delicious, StumbleUpon, Technorati, and Google Bookmarks.
- Social networks are websites that allow people to connect with other people. Examples include Facebook, Twitter, and LinkedIn.
- Social skills (social knowledge) are websites where people share the answers to the questions. Examples: Wikipedia, Yahoo! Answers.
- Sites for sharing pictures and videos: YouTube, Flickr, Photobucket, Zoomr.
- Sites to share documents and presentations: Scribd, SlideShare.



Figure 5. Social media [12]

Social media is not just a tool for viewing images and friends back in January on some events from the past. Social media have become a tool with measurable and predictable power which really brings many benefits for online businesses, and some of them are:

- Branding: This is probably the most obvious benefits for most online businesses that use social media. Regardless of whether Internet users have a direct connection with your brand or not, they will still always see your brand within the network they use. Which regularly update their content, consumers will see it more often and therefore increases the likelihood that they will remember it. Regardless of the industry business, brand awareness is vital for success in the future.
- Reputation management: Managing your online reputation is very important because no matter whether you participate in online conversations related to your brand or industry, others will surely debate and give their opinions. Therefore, it is useful to know what consumers think about your products, services and everything else that has to do with your business, in order to have time to react adequately. Because social media are open to all, everyone has the opportunity to say what he wants, and also on your business. Therefore it is very important to build trust with consumers. Feedback from social media can show you the way in which business should be moving, in terms of relationships with consumers, but also in many other matters relevant to the business.
- Customer service: Providing support to customers neither is vital for the success of any business, nor do social media are no exception to this rule. When you let people skim through social media, whether it's praise or criticisms, it is important that the response to time and try to thank her or help. Social media provides a platform for communication, "One on One" for the business that is definitely an option you should use because the communication takes place in real time, which is much better than a phone or e-mail. Responding by providing timely and useful information, or give thanks for the support is something you cannot see the entire network, which also shows your commitment and concern for consumers.
- Lead-Generating this: Social media can serve as a tool for finding customers, promoting the establishment of many other useful links. Conversation is constant within each social network so that the most important thing is monitoring these conversations and to benefit the business. These Lead-these can be anything from an idea

for an article to an online sales. For example, a simple search blogging platform Twitter, you can gain insight about what it says about your industry and possibly communicate with interested potential customers.

- Education: In every industry, it is important to be innovative in their field and always find the best solutions for the problems or the situation. Social media provide free access to the information coming from other business, the media, friends, associates, and so from the competition.
- Competitor analysis: In every industry is vital to keep up with the competition. Social media make this process much easier by allowing you to see the content and conversations that competitors have on their social accounts. These conversations with customers and facilities, such as that offer may well assist you in your positioning with consumers.

VII. BRIEF REVIEW OF THE SITUATION IN THE SERBIAN REALITY

For us even extended to the appearance of a large number of sites, relying on various Web technologies, report various general and specialized information and the promotion of free services and is pleased to note that the blogosphere and thrived [9]. Easy installation of free content management systems, especially Word press platform, contributed to the increase in the number of sites with different content and form of the blog.

Unfortunately, while it appears that the different generations of technology, people are inclined to create content for the Internet users in our likeness, while business area and company rarely realize that through the Web and can transmit their message a number of potential customers and introduce them to your products and services . Still not satisfied with the integration of online payment systems, which should allow companies to establish a new branch of business. Companies are still made in the late nineties site should understand that it is high time to modernize the site and instead of "welcome address the Director," offers visitors useful services.

Republic Statistical Office of Serbia has presented research into the use of ICT in Serbia in 2008.

Featured survey results:

- More than 2 million people use the Internet in Serbia (35.6%)
- 12.5 million Internet users in Serbia every day (or almost every day)
- 7% of the population of Serbia buys online (6.3% ordered goods or services over the last three months)
- 137 million. EUR turnover of e-commerce in Serbia in 2006. g., a projection of the volume of e-commerce in 2010 is 346 million. EUR.

- 60.4% of Internet users are looking for information about goods and services over the internet.
- 25% of Internet users read blogs; 7.2 percent creates or maintains a blog.

VIII. CONCLUSION

Prospects of development of the Internet as a positive!

The announced price cuts Internet access, computer equipment price itself, a critical mass of Internet users only confirm what you may see a little preview of what the all-new online services appear to us, or if you have information about what it will all show up online in the future .

Published data on the volume of e-commerce in Serbia (probably referring to the B2B and B2C sectors together), where 46 percent of the Serbian Internet users have purchased cards, and 57 percent of orders a delivery (to be counted here and the percentage of purchase via e-banking system uses 10 percent of Internet users), enough talk about the potential of trade over the Internet. If the media is the way of sufficient quality to be promoted this kind of information will soon be in Serbia would intensify the development of online business.

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Importance of Implementing Customer Relationship Management

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Abstract - The way to keep your customer's organization and ensure repeat orders is to develop a management strategy based on the data and focused on the user, in order to increase customer satisfaction by developing long-term relationships. This business strategy is referred to Customer Relationship Management - CRM. CRM is the mechanism by which the company knows who are the buyers of the organization and allows their gaining, retaining and creating loyalty. Customer relationship management (CRM) is a management strategy that unites information technology with marketing. It originated in the United States in the late 1990's, and, to date, has been accepted in a significant number of companies worldwide. On the other hand, some people have negative opinions of CRM; such views hold that it is difficult to implement successfully and that its cost - benefit performance is low, among others. Implementation of CRM system refers to the process of introducing CRM software within the company and this is an expensive and time-consuming process that carries the risk of possible failure. A large percentage of failures highlight the importance of implementing careful selection methods of implementation. In this paper, the emphasis will be on examples of successful and unsuccessful implemented CRM in the enterprise.

I. INTRODUCTION

Both for selling as well as for marketing, they must have knowledge of everything - leads, queries, customers, sales, feedback, relationship, and requirement and so on. Similarly, the advent of technology has brought about an apparent change in the organizations' approach to customer relationship. And technological advances have brought more of company's relationships to be managed through electronic means.

There is a need created for companies to automate services and personalize communication with customers. The need is primarily about having an application or a system in place to effectively manage the sales process and customer relationship; capture vital data and information about customers - purchase history, revenue generated, up selling / cross-selling opportunities, etc., and generate sales or create quote orders.

To be precise, the need of the hour is to have a 360-degree view of one's business. This is why the Customer

Relationship Management has gained so much popularity among all businesses.

II. WHAT IS CRM?

CRM is short for Customer Relationship Management. Customer Relationship Management is defined differently in the works of foreign and domestic authors. CRM strategies at the level of the whole company, which is focused on creating and maintaining long-term relationships with customers ... although there are a number of commercial software solutions on the market to support the CRM strategy, it can be said that the CRM separate technology, it is first comprehensive approach to the philosophy of an organization that focuses on the consumer [7].

Essentially, CRM aims to put your customers at the center of the information flow of your business.

In short, the company or organization is very rich in information about customers. It knows lots about them. But the information is not shared. It's only available to specific job functions. If a sales person wants to know about what issues are outstanding with customer service for a particular customer, then they have to make contact with the holders of that information and wait for a response. If the salesperson is chasing the information in response to a question from the customer, then the customer also has to wait.

So, although many companies are information rich, the information is compartmentalized. It is not a corporate knowledge and the ability to access information and to deliver it rapidly to customers is low - High quality customer service is compromised.

CRM is an application that Enables companies to make the move towards being a customer centered organization by putting the customer at the center of all the information that relates to them and Allowing authorized people within the organization to access the information.

In a customer centered organization, salespeople would have access to all the information that affects their relationship with their customer. The conversations, the emails, the complaints, the complaint resolutions, all the

information that had been sent to the customer, who else in the company the customer had spoken to everything that affects their ability to service the customer and sell more product or services to them [2].

Customers of a customer centered organization feel more valued. Their requests are dealt with more rapidly and accurately because all the information required to service the request is in one place. Customer-sized organizations may have a higher customer retention rates than competitors organized along traditional lines because of this.

In a customer focused company, the information flow and the ability to access Information is very different:



Figure 1. Customer information [5]

III. SIGNIFICANT STEPS TO IMPLEMENT CRM

Many Customer Relationship Management (CRM) applications saturate the marketplace today, but does choosing the right package to automate your Sales, Marketing, Service and Support functions automatically guarantee you success? Although selecting the right product is important, it is only one piece of the implementation cycle that will assure the expected ROI and the 'buy in' of employees. Keep in mind the overall goals of a successful CRM solution [1]:

- A framework for all areas of customer relations
- A record and report on the activities related to groups or individuals
- Analysis tools and reports for forecasting
- Ability to predict areas of success or failure.

A successful CRM solution must meet the goals without compromising employee productivity; thus it is also important for the solution to incorporate:

- Task automation for repetitious day-to-day activities
- Tools to avoid missed opportunities or forgotten promises
- A process that is tailored to best fit in the company's existing business processes.



Figure 2. 7 step methodology to successful CRM implementation [9]

IV. SUCCESSES AND FAILURES IN THE IMPLEMENTATION OF CRM'S

CRM is now with many companies and marketing management Software Company and misunderstood and presented. Companies were selling front office and back office solutions but they leaked fundamental strategic benefits that CRM can provide. Problems of implementation are to identify steps to access only the implementation, such as [4]:

- ❖ Identification of who the consumer companies
- ❖ Differentiation in the consumer database
- ❖ Interaction with consumers that have been identified to have long-term value for the organization
- ❖ Customization services, and other sophisticated products need to increase the consumer's part, and strengthen customer relations.
- ❖ The consumer profile of the case, except for a past purchase behavior and profitability, and contain information about days, the preferred channel of interaction, family status, lifestyle, professional career, and a number of other elements whose importance varies from industry to industry.

Data collection is a major problem and a very important component. Within an organization can identify CRM inconsistencies that arise when an organization deals with CRM separate department or departments, and there is no real cohesive CRM strategy with all the processes and functions. CRM usually engaged in the marketing department, consumer service and sales. Relationships with customers are already problematic areas in the organization that are by nature oriented to their needs [6].

Also one of the problems for the successful implementation of CRM is related to the transformation of the company and the way it looks and runs business

with consumers. Since this is a strategy for achieving competitive advantage and profitable core component of financial success. Modern CRM organizations ranging from the reasons why the consumer did something or why something happened to him, and organizations with the remains of monopolistic behavior starts from the premise that they are always right, and that the user is the only sinner in the process of exchange. They are very unpleasant experiences of many consumers who have been severely punished for their minor flaws after several years have been very profitable organization that serves them.

One of the problems implementation CRM may be people who are the last but not the least important issue in the implementation of CRM strategy. Only with the attainment of true orientation of the user's problem solving in technical or part of the credit as well as marketing and sales, it is possible to create a corporate culture that is the true condition of the implementation of CRM strategy. Kindness, knowledge, qualifications, skills, behavior and motivation are prerequisites that efforts to establish user centric organization does not break down at a point for CRM always been the most vulnerable - the human factor.

For CRM, a relatively small number of users we do not need the support of advanced technology solutions. The best example is based on close daily contact with direct knowledge of customers. Beside, necessity that the company has imposed economic necessity to survive in the market, CRM is conducive to the development of technology and price reduction.

The implementation of a CRM system is extremely demanding and requires commitment at all levels of the company. Very big problem is the integration with existing CRM system in the enterprise IT systems. It is often impossible to implement without use middleware, software which has the task of bridging the barriers between CRM and existing IT systems. It is important to remember that the CRM strategy, not just software. Many people forget this and think that buying CRM software will do the job. Need instruction because of all employs CRM in itself brings a major change in the work of human factors. It should be noted that the company's 60 - 70% assess implementation failures.

For example, FAW-Volkswagen, which was founded in 1991, an automobile manufacturer in China, and the only one that produces the high class and luxury Sedan. Now, with help, mySAP CRM leads the field of customer relationship management. Six months ago, they could not, through the sale of regional dealers, get to feedback from customers and market intelligence. The company has implemented SAP CRM with the desire to improve service and reach the essential knowledge about your customers. This solution on a single platform combines all function for its customers, from the contact center to the sales, service and marketing, said Wang Qiang, a

senior manager in the management information services. MySAP CRM Customer Interaction Center (CIC) is a new service to customers Volkswagen. This service applies to sales, service and marketing. Customers can make contact with the company through telephone contact center, fax, e-mail, and Internet. MySap CRM is closely connected with the essence of dealing with SAP solutions for companies such as Volkswagen. Application of this solution approach is real-time information on products, dealers and consumers. In this way, consumers get the freshest information products. Better communication with customers, improving products and services, faster response to changing markets, some of the main objectives of the campaigns. Ten of Volkswagen agents working in the front office, answering about 800 call a day! This solution enables calling and receiving calls, email management, monitoring, supervision and development of the communication with the customer to and caused the direction of business processes, operational efficiencies and key performance indicators. In this way, the Volkswagen became more competitive in the market.

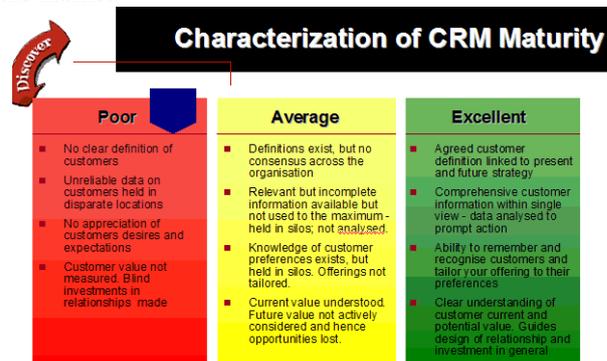


Figure 3. The characteristic of implementation of CRM [10]

A. An example of successful implementation

Examples of successfully implemented CRM will be presented for: Amazon.com and Dell Computers.

- Amazon.com

Amazon.com was once the largest online bookstore, and today is the largest internet store. They were among the first to recognize the advantages of on-line business. Their system uses a client contacts, followed by books or articles which the buyer's search, where the longest maintains, monitors, etc. as the Client buys. These data are analyzed and, based on the information provided to the client for products offered by the system determined that the client may be of interest. In most cases, customers can buy and makes him satisfied.

	Traditional physical trade	Amazon.com
Superstores	439	1
Headlines by superstores	175.000	2.500.000
Costs of operation (% of sales)	12%	<4%
Sales per employee	100.000 \$	300.000 \$
The coefficient of	2 - 3x	50 - 60x

inventory turnover		
Sales per m2	250 \$	2.000 \$
The cost of rent per m2	20 \$	8 \$

Table 1. Comparing the business models of physical and virtual bookstore business analysts in 2007 [8]

- Dell Computers

Dell Computer Company sells computers. His business successes were based on BTO Build to order principles, which were significantly reduced inventories. Their strategy was based initially only on large professional customers. Strengthening the importance of the Internet and online sales of Dell's specifications spread to residential customers. The development of the Internet and e-business enabled cheaper and more effective contact with customers, generating large customer profiles and personalized access to the client.

In 1997 launched the personalized page called My Dell is then called Premier Pages. The system offered a complete view of the customer relationships with the company, such as a history of transactions, etc. They introduced and fault diagnosis service via the Internet.

The market was segmented into three main groups with subgroups. For a subset of preferred customers and business systems division has built a wide CRM system. Using the methods detailed customer profiles, which are based on buying patterns, etc.. All this brought the Dell costs significantly less and therefore a great competitive edge.

B. Example implementation failed

AT & T Wireless is the mobile phone operator. 2003rd After unsuccessful attempts implementation upgraded CRM system lost more than a few thousand customers and about \$ 100 million of unrealized revenue. After that it 2004th took them past rival Cingular. 2,001 were first installed Siebelov CRM system. This implementation was not completely successful, and the constant upgrading work. 2003rd began the process implementation new version 7 Siebel CRM package that is developed according to their requirements. But even that version was not good at the end of the year and started working on upgrading the system to 7.5 versions. However, a huge problem of integrating CRM into existing information groups in the company. In addition, before the end of the year, the U.S. Congress approved legislation that enabled customers to retain their mobile number even after switching to another provider. Amidst very serious changes in the system were given a large number of customer requirements for the establishment and termination of services.

The biggest mistake was that the development of middleware programs that are supposed to be the link between the new CRM system and existing information Systems Company was not required communication between teams of experts who worked on the integration

and implementation of the CRM system. After one team was able to write code that should connect the two programs, the other team in the meantime changed by another program doing the work of the first team void, and such a procedure would be repeated indefinitely is common practice to freeze the activities of certain parts of the system to do not encounter such problems, but this practice has not been applied. Because of the large number of customer requirements for the establishment or termination of employment due to the new law on the composition of a phone number in late 2003 broke up AT & T would cost many customers and loss of revenue.

C. Everyday example implementation CRM

One of the most picturesque examples with which almost all of us everyday, is the application of CRM in retail stores, especially in large retail chains, such as C-in our shop or Pekabeta, and recently Merkator. On one hand, we have a small shop "from neighborhood ", whose owners (sellers) know almost all of their regular customers and their habits, needs, their nature, including their financial condition. In this case, CRM performed by the staff in the markets more or less successfully, without any additional technological tools (databases, CRM, etc. to the application.). And only on the basis of experience. Their relationship to known buyers is completely personalized and intimate. Unlike the small market, where detailed knowledge of customers and their habits, large retail chains with high turnover can not achieve this interaction. Because they can summon help in advanced tehnologje. For them to CRM, in addition to the mandatory smiles and friendliness of employees, based on the huge amount of collected "raw" data. Almost all of these retail chains emit a "smart" card personalization and customer identification, in which are recorded all purchases of individual customers. All these data, together with information from the environment, converge in a single database, from which the advanced technologies, such as data-mining and data-warehousing, extract data, perform analysis and create a profile of each individual customer. Based on the profile generated, each customer a personalized approach. For example, if a customer is given over a period of a lot of resources spent on the purchase and home hemje children's diapers, and if it is put on sale a new line of products complementary, CRM automated system will it based on all this information and more analysis to inform about the new product, its benefits and cost, by e-mail, text message or via the call-center. This message may contain links to the company's Web site, where the customer can environmentally get information on the product, as well as that of possible orders for home delivery. Also, the system can inform customers about the current discounts, bargains, promotions, working hours or, say, the crowds at the mall.

V. CRM IN SERBIA

Creating business strategy and the quality of the business environment are important preconditions for strengthening the competitiveness of the economy. Hence the devastating fact that in accordance with these criteria, according to the Global Competitiveness Rapport 2006, Serbia was ranked 86th position (behind: Macedonia, Namibia ...) out of 116 countries in the world.

Improving the competitiveness of Serbia should look at shifting the focus on micro level decision-making, as well as acceptance of the new philosophy of business - strategic management and innovation. One of the ways that can have a significant impact on raising the level of competitiveness is the development of the concept of CRM (Customer Relationship Management).

In modern market economies, along with the development of computer technology, Internet and software for database creation, priority business becomes a two-way communication companies and product and customer service.

The survey was conducted in 2006. The EU has confirmed that companies without CRM:

- On average lose 50% of their customers every five years,
 - About 65% of lost customers leaving because of poor service and communication,
 - The cost of acquiring a new service to the client is five times higher than the cost of retaining the old.
- Companies that have developed CRM concept:
- Growth of almost 60% faster than their competitors without developed CRM
 - expand the market by 6% per year,
 - 10% charge more for their products,
 - realize the return on investment (ROI) of 12%,
 - Increase customer loyalty by 5% can result in increased profits by 25% - 85%.

These data tell us that in the future adjustment of the Serbian European market economy and way of functioning, particular attention must be paid to the consumer. Without the "total" data processing consumer can happen to us if we lose them, and do not be aware of that. Commitment to quality in business, the introduction of ISO standards in the functioning of the company, and therefore greater commitment to the consumer through the CRM concept is the only way to survive in the market.

VI. CONCLUSION

Be sure to remember that no matter what size your company may be, customer relationship management is very important. New technology is available and using it to keep your customer relationship management techniques up to date is very important. As you use new strategies and customer centered values your customer

relationship management will improve. Evaluating and re-engineering work processes can also be helpful and finding a customer relationship management consultant may help you make these types of changes easier. It is important to use good customer relationship management to improve the relationships between your company and your customers. Happy customers will result in more sales for your company. Ensuring that you have good Customer Relationship Management will help move your company forward to a successful future. Be sure to keep your company on the path towards success and keep your Customer Relationship Management in tiptop shape!

Analyzing this work, it can be said that the CRM:

- The Companies strategy, which is oriented towards creating and maintaining customer relationships
- Philosophy direction to consumers Organizational culture that contributes to the creation of a suitable climate for the establishment of a true relationship with customers
- A set of methodologies that define ways of establishing and maintaining good relationships with customers
- A set of software utilities that provide technical and technological support to managing customer relationships.

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Comparison of Internet Marketing in Serbia and in the World

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Abstract - Internet as a global network covering all the world countries is a compelling medium in the implementation of integrated marketing communications. In this paper, we briefly elaborate on the phenomenon of the Internet and its role in advertising in our country as well as internationally. We explain strengths and some weaknesses of online advertising (Internet) in comparison to offline advertising (TV, magazines, etc.). This paper also explores trends, perspectives and budgets for internet advertising in the world, and also provides some vision for the future of this medium.

I. INTRODUCTION

Theory and practice of marketing get new features and special importance due to the development of information technology- especially global Internet network. Internet marketing gives a new dimension to the classic marketing mix such as the volume of information, auditorium, search speed, market response etc. Internet marketing enables consumers to be senders as well as recipients of information. In the following text we are analyzing data about the general usage of the Internet in marketing in our country and in the world.

II. SERBIA AND HER NEIGHBORING COUNTRIES

Marketing budget in Serbia notes a rise from 2.5 to 6.3 million during the period from 2009- 2010 (Table I). Offline media have an obvious domination. The undisputed first place is television with more than 50% share in total marketing spending, and the second place is shared by press and radio.

Croatian internet advertising budget has also recorded a growth from 15.2 to 20 million in the same period of 2009-2010 (Table II). If we compare Serbia and Croatia in their internet marketing budgets we can see that in 2009 Croatia has six times greater budget than Serbia however, in 2010 that difference was reduces to half. These relations are more clearer if population and consumption in 2010 are compared (Table III).

In addition to the larger population of internet users in Croatia, internet marketing investments are disproportionate.

TABLE I MARKETING BUDGET IN SERBIA

Marketing budget in Serbia (millions €)				
Media	2007	2008	2009	2010.
TV	102,00	114,90	95,00	98,00
Press	40,10	51,70	36,00	41,00
OOH	22,90	26,80	20,50	21,00
Radio	7,50	8,70	6,50	8,00
Internet	-	-	2,50	6,50
Total	172,5	202,1	160,5	174,5

Source: www.agbnelsen.net

TABLE II MARKETING BUDGET IN CROATIA

Marketing budget in Croatia (millions €)				
Media	2007	2008	2009	2010.
TV	148,39	149,93	162,96	177,58
Press	65,82	62,04	54,83	62,98
OOH	12,08	8,10	6,92	8,26
Radio	-	-	-	-
Internet	-	14,70	15,20	20,00
Total	226,29	234,77	239,91	268,82

Source: www.agbnelsen.net

TABLE III POPULATION AND SPENDING ON INTERNET MARKETING

Population and spending (2010)				
Media	Population (million)	Users (million)	Spending on marketing (million €)	Spending per user (million €)
Serbia	7,306	4,107	6,5	1,58 €
Croatia	4,290	2,244	20	8,91 €
Relation	1,7 : 1	1,8 : 1	1 : 3,1	1 : 5,6

Source: www.agbnelsen.net

In general, Croatian companies invest 5.6 times more money in marketing and advertising. Serbia spends € 1.5 while Croatia € 8.9 per Internet user.

Comparative Analysis of Internet marketing in Serbia and Croatia shows appreciable differences. Serbian budget

for Internet advertising between 2009 and 2010 has increased by 160% (from 2.5 million € to 6.5 million €), which in total advertising represents 2.16%.

Croatia had budget increase from 15.2 million € to 20 million €, which represents an increase of 31%. The absolute share of Internet advertising spending is 7.43%.

In Croatia in 2009 Internet advertising budget was € 6.77 per person, while in 2010 it was € 8.91. This is an increase of over 30%.

A. Internet population in the region

Internet population mostly corresponds to the country total population. In the analysis we took the region of five countries: Serbia, Croatia, Bulgaria, Slovenia and Turkey. The whole region of South East Europe has 32.3 million internet users¹. 70% of total internet users from all five markets combined are living in Turkey. Serbia with 2.7 million internet users makes 8% of the entire region internet population.

B. The rising importance of online marketing

The growing impact of online advertising can be seen in² [7]. The share of online advertising cost in the total advertising cost fluctuates in relation to the European average in 3 of the 5 countries. From the [7] we see a growing share of online advertising expenditure, where Turkey records around 14% which is more than the European average. On the other hand, Serbia records the lowest spending rate in the observed region.

C. Online advertising costs per internet user

Online advertising costs by internet users show a completely different trend³ [7]. Slovenia as a small country in comparison to Turkey has almost 2 times higher advertising costs per user than Turkey. Serbia has the lowest spending rate per user (around 2.4 €), but still higher than Ukraine, Romania and Belarus.

D. The introduction of the internet in the region

Internet penetration in the region (percentage of total population using the Internet, February 2012) shows that Slovenia is the leader in the region and Bulgaria and Croatia are in front of Serbia as well [8]. Serbia has 10 percentage points greater penetration than Turkey. The average internet penetration in CEE is 55%.

E. Internet advertising costs in the region

Internet Advertising Costs in Serbia have increased by 35%. Largest increase in the cost of Internet advertising in the region in the period 2009/2010 has Turkey, around 100% increase. The absolute amount of internet costs in relation to Serbia is for about 3.5 times higher in Croatia, four times higher in Bulgaria and more than 4 times in Slovenia.

F. Internet advertising in Europe

According to the report from a conference held in Barcelona in 2012 total advertising costs for the ten countries where over 75% of the annual revenue generated by the leading seven countries [9] shows that the biggest spenders are UK, Germany and France.

The second group includes Italy, Netherlands, Russia, Spain, Sweden, and the third Norway and Denmark. 26 represented countries [8] show the growth of online advertising and that CEE markets have the highest (fastest) growing advertising costs.

The share of the mobile display advertising as well as online in total for observed countries is 1.7% and is very different in different countries: up to 1% in the Czech Republic and Poland, to 2% in Turkey, Hungary and Austria, more than 2% in Denmark, Netherlands, Sweden, and 3.6% in Italy and Norway. Highest percentage of usage of mobile screens as internet advertising is in the UK⁴ [7].

G. Comparison of online advertising in the period 2009-2012 between the EU, USA, China

In order to analyze the state of online advertising in our country and in Europe we will present trends of marketing development in three mega markets in the world: EU, USA and China during 2010-2012. Reference [7] shows that Europe is catching up with the USA and may become the largest online advertising market by 2012. From the data [7] we see that the European Union closely follows the United States and in online advertising. The third partner in this comparative analysis is China, with a fast growth from 1 in 2009 to 12 in 2012.

Internet advertising in the world has a growing progressive path that corresponds to the tendency of the spread of the internet both in Europe and in the United States, China and other countries.

Our country has a modest participation of online advertising regarding the absolute amount of spending. A promising percentage of Internet advertising growth is evident, which is growing every year quite a bit.

III. ADVANTAGES AND DISADVANTAGES OF INTERNET ADVERTISING

Because of the strong application trend of the Internet in marketing the elaboration of the advantages and disadvantages actually means that the advantages should be encouraged and disadvantages avoided or brought in tolerant frames with the aim to use the Internet as a huge competitive opportunity. In theory, there are a lot of classifications regarding this topic and we will try to elaborate as systematic and comprehensive as possible. According to [5] there are five advantages and disadvantages of internet advertising which we modified into Table IV.

¹Slovenia: Valikon; Bulgaria: Synovate; Croatia: Valicon; Serbia: Gfk; Turkey: Ipsos KMG – Gemius SA: Internet Audience Measurement (age groups 15+ Croatia 12+)

² 2010 IAB Europe /IHS Screen Digest) Warc, HttPool Online advertise; AGB Nielsen Srbija 3,6%

³IAB Europe: ADEX 2010, European Online Advertising Expenditure; Bulgaria: GemAudience; Serbia Gfk Belgrade Statistical Office of the Republic of Serbia (starosna grupa 15+)

⁴IAB/PWC/Screen Digest

TABLE IV THE ADVANTAGES AND DISADVANTAGES OF INTERNET ADVERTISING

ADVANTAGES	DISADVANTAGES
Directing the target audience.	Reliability of the measured effects (different results of the collected data).
Interactivity and creativity (creating a long term partner relations, customer imagination about the image of the company and its products).	Large number of ads and long search time (large number of ads reduces perceptibility and the time needed to find the ad).
Time availability and relatively low price.	Dynamics of changes in audience characteristics (because of the changing audience there are no real data available).
Sales potential.	Possibility of fraud and problems with the data protection (the possibility of abuse, unauthorized card use, collecting data about customers, advertising directed toward children).
Virtual sales of products and services.	The relative increase of the advertising cost (Setting up and maintaining a good site can have growing costs).

A. Perspectives of internet advertising

Looking at the explosive growth of online advertising in our country and in the world we can conclude that this trend will continue in the future withleaping growth of Internet marketing in mind:

- Further growth of the global worldmarket,
- Exponential growth and implementation of new information technology.

As the growth of online advertising is evident, we try to look at several promising major routes. Any new approach to marketing can influence the change of the paradigm of the future marketing communications.

The permanence direction of the changes that consumers will continue in the future consists [3]:

- Social orientations in the era of individuality;
- Orientation of the material in the era of relations;
- Requests for information from the abundance of information, experience of the real to the virtual experience;
- Orientation of the device.

The method and approach to marketing mix is basically accepted in internet marketing with additional elements that e-marketing mix gets which includes [6]:

- Virtual community
- personalization
- Online presence

- privacy
- Security.

Other authors include the brand management in the additional elements. From the analysis of this approach, the author [6] in addition to the four main segments of marketing mix (digital products or services, prices, sales and distribution, promotion) expands so called online marketing mix, "with four additional elements":

- Management of virtual communities,
- Management of personalization,
- Management and Consumer Services
- Managing online presence.

The issue of privacy is very important to consumers and is a big problem on web sites as part of this we can conclude that the protection of intellectual property on the site is very difficult [1]. In the foreground stands out the problem of distinguishing what are legal and what are ethical questions. If we are doing something that is not legal we violate the law, and if we are doing something that is unethical often there is no violation of the law. The main problem that arises here is that the information technology is still not clear what is illegal and what is ethical. Reference [2] states the following division of ethical questions:

- The presence and use of information;
- The authenticity of information;
- Information as intellectual property;
- Information access and payment.

The problem of data and privacy protection in EU is regulated by Directive from 1998. Customs is controlled via the WTO as a duty free access. Intellectual property is defined in the Green Book, and the ratification of the EU directive and WSIPO (World Intellectual Property Organization).

Electronic payment is defined by the Directive for the issuance and monitoring of electronic money. Finally, consumer protection is defined by resolution which confirms existing consumer protection in the European Union (the data protection legislation in the EU [2]).

Regarding the e-commerce the emphasis should be on data protection issue and the possibility of fraud. Payment on the Internet has a major problem in security transactions. Most frequently used method of payment on internet purchases is via the so-called "online payment credit cards." It is not a completely safe transaction and many companies have engaged themselves to the field of cryptography and working to develop a security protocol for Internet payment.

For the company to survive in the market it has to sell its products and services and so close reproduction or business circle. From this it necessarily follows that the real communication with customers is a holistic process where customer relationships are programmed, promoted and maintained. The complex relationship with customers is a combination of good business strategies and modern

information technology. Customer relationship management Customer Relationship Management (CRM) is a process combining:

- Identification of customers;
- Differentiation of customers;
- Adaptation of our supply requirements and needs.

In order to create a new value, increase customer satisfaction and obtain customer commitment we have to [4]:

- Ensure better service-effective development of call centers;
- More effective and efficient products and services;
- Assisting the sales staff about closing the deals;
- Simplifying the process of marketing and sales;
- Identify new customers.

With the development of internet marketing software functional capabilities were significantly expanded. As the authors state, the use of the Internet globally recorded a dramatic growth and the number of Internet users who buy products on-line constantly growing. Here, as in the previous chapter written security and data protection is very important.

At a conference in Stockholm, Ericsson has presented his vision of the future in terms of communication. According to their forecasts until 2020, 50 billion devices will be connected to the global network. According to the same estimates, by the 2016 there will be about 5 billion high-speed mobile Internet users. All the mass connectivity and networking will enhance the mobile telephony multiple use of the Internet, and therefore the Internet Advertising.

From the point of view of our country, Telekom Serbia has developed a complete internet solution for the successful operation of a business. This company has created a web packages with all the tools in one place that are needed for effective business operation. "Internet packages start with a dynamic IP address and Internet Pro package with static IP addresses that are available at affordable prices. Telekom Serbia in association with the Ministry of Education launched a comprehensive action introduction of the Internet in every school in Serbia. Studies show that the population aged 15 to 19 years in Serbia is using the computer. The largest usage of computers is for fun and games, and for education only 8.6%.

IV. CONCLUSION

Marketing Communications in the international market have its own characteristics and barriers that should be in mind before getting involved in the international market.

The growing connection between technology and the expansion of the use of the Internet global network point to the Internet as a medium of international marketing with a number of advantages and disadvantages. The global presence of the Internet and the increasingly frequent use led to the fact that the consumer is becoming a key figure in the marketing, because it now offers a number of information about the quality (price) products and services. Internet advertising has a wide range of advertising forms. Its application depends on the level of education marketing manager and his mastery of the concept of IMC. For example, our country's Internet advertising every year is growing, however, in comparison to neighboring countries and the EU average, the proportion is still small.

Between the 2009 and 2010 internet advertising in Serbia grew by 160%, but the total advertising is 2.16%. In theory, we see the presence of many classification advantages and disadvantages of internet advertising. Increasing usage of internet advertising leads us to think about how to increase the benefits and remove the disadvantages. In this paper, we present some perspectives of Internet advertising without the belief that we have achieved a wholeness approach.

We think that Serbia's EU integration will increase economic activity, boost competition in the domestic and foreign market and the Internet will become one of the most important competitive advantages. The introduction of Internet advertising in Serbian companies in our opinion should go in two directions. First direction is to increase internet advertising and the second is to increase Internet in general. In this sense, we think that the introduction of the Internet in the schools is the best way of communication in economic and social terms.

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Quick Response Codes from Companies

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Abstract - The computer era is the period where the Internet surfing is an unavoidable part of everyday life and where web sites are becoming increasingly more frequent form of media, advertising and marketing. However, last few years appeared simpler, faster and more efficient way of providing information and way to reach them. The answer is very quick and quite interesting - QR (quick response) code. This code is very useful, because it reduces the time spent in front of computers and typing the web addresses and links. QR code allows the user to have it all via mobile phone. This kind of coding and its possibilities of using it for marketing purposes are limitless. It brings quality, speed and easier access to information, which includes interaction between user and advertiser. QR codes in advertising appeared in Serbia, too. People can meet them at various places, in magazines, newspapers, in buses, on billboards, on the shop windows in shopping malls, on the product package, etc.

I. INTRODUCTION

Since the Web began to take momentum and became the dominant mode of communication, presentation of ideas and products and advertising, the problem appeared. Problem was how to merge physical and virtual world. For a long time, in order to present the web page to the masses through the conventional media, press and television, there was only one way - to print the URL of that site in a commercial or music video. Appropriate merging of two worlds, physical and virtual, would imply click on the printed URL and immediately access to the multimedia content. Thanks to the growing popularity of mobile phone as a web browser and the platform for a variety of applications and now the existence of the QR Code - there are no more obstacles. QR codes are very flexible and allow storage of far more data than traditional bar codes. In addition, it also provides instant access to online information and monitoring. In recent years the use of QR codes recorded tremendous growth in the use of different businesses around the world.

II. BACK TO BASICS

QR codes in the form that we use today have been created in Japan by Denso-Wave 18 years ago, with the idea to create a two-dimensional bar-code or the so-called matrix-code, which could be quickly scanned and processed. Therefore, the acronym QR means Quick Response - fast response, translated from the English language. Although it was initially used as a code for tracking parts in vehicle manufacturing, now has a much

broader use, as in monitoring the market as well as in commercial applications pointing to mobile users.

The basic idea of using QR codes is simple and ingenious - using the application in the mobile phone user scans (photographs) QR code and after that user is automatically taken to the page that is written in the QR code. The most basic use is the most important because it connects the print media (newspapers, billboards, fliers, business cards, etc.) with multimedia content, thus enriching both.

Particularly interesting possibility for marketing companies is that through specialized programs for generating QR codes can have very important statistics - which billboard has the most daily and total scans, how many people scanned the code of specific campaigns, etc. Thus, company gets a direct insight into the success of a particular advertising campaign and strategic information about customers and how to reach them.

III. FUNCTIONS AND CHARACTERISTICS OF QR CODE

The two major applications for the ordinary user are, of course, code reader (decoder) and code generator. Moreover, both are for free, just like the QR code. When the reader is installed in a mobile phone, it makes from user's mobile phone a real scanner for QR codes.

It is interesting to mention that, as increased global interest in this technology, Nokia has decided to equip its new models of mobile phones with installed readers and, also, Google developed its own reader of QR codes.

The most important thing is to mention that the mobile phone is not only a code reader. Worldwide exist systems which send user an MMS message with a picture of QR code with the appropriate content, after that user's mobile phone (while showing the picture code) becomes ticket for concerts, the identification card at the seminar, etc.

Characteristics of QR codes [4]:

- 1) speed - QR code is the fastest way for directly linking offline activity with online contents,
- 2) unlimited space for promotion - lead customers where company has limited space for placement of promotional messages (billboards, newspapers ads, product packaging) to the place

where company has unlimited space to promote, such as the post, contact page, video, photo gallery, list of stores, etc),

- 3) growth trend - every user who has a smart phone has the ability to scan company's code and moreover number of this kind of users is growing,
- 4) easy - QR code is very easy to create, even easier to implement and the most important, easiest to use and
- 5) free - making the QR code is for free.

IV. QR CODE MOMENTUM

What actually makes QR codes to seem so interesting is the high level of implementation. Japan, as a country of origin, is already leading in use. From billboards, where you can see more information about events and book tickets, newspaper ads linking to mobile site of producers and codes on products through which users can get additional content (tones for mobile phones, pictures and online games), simply - QR codes is not possible to avoid. If customer decides to buy the Japanese McDonalds Big Mac, on the cover he/she will find the code that leads to a page with information about the nutritional value of the food that he/she eats and at the bus stops user can directly access information about the timetable. Moreover, Japanese airports use QR codes as a way of electronic tickets. Code, which is printed on the plane ticket or sent to a mobile phone, allows user to access the passenger side of and the entrance to plane. Coca-Cola, the magician of branding, has embraced new methods to promote their products with specialized digital machines with code scanners, which allows its customers to try new drinks.

Convenience and accessibility of technology for QR codes are now available in all parts of the world. QR codes have been accepted by the major global brands - there are almost no large companies that did not use QR code and the number of them is growing by the day. In addition, some of them are Pepsi, General Electric, Adidas, Starbucks, and Chevrolet and from recently it is used by absolute leaders in modern communication, Google and Facebook. QR codes will be seeing more and more frequently in Serbia, too.

V. QR CODE WIDESPREAD USE

The interesting facts about QR codes are wide and are not only the possibility of implementation, but codes, as a new technology, attract great attention. Several companies took advantage of this as an additional way to encourage advertising campaigns.

Famous fashion designer, Ralph Lauren started campaign which uses QR codes in print ads. It doesn't matter whether the user is on the bus on the way to work or at home, it is enough to take pictures with and get instant

access to selected articles from the magazine, catalog and new collection online store.



Figure 1. QR code of Ralph Lauren [10]

Northwest Airlines (NWA), the largest foreign airline in Japan, is an excellent example. The goal was positioning of NWA as a leader in technology and gathering the contacts of the target group. NWA used huge billboards with QR codes and the campaign received a lot of publicity, both in the media and among people, successfully promoting the NWA as a company that is technology innovator. This kind of advertising increased the visit of the website for 35 percent.

Popularity of QR codes has arrived up to the printed media, which is slowly accepting the technology. Certainly, one of the largest promotional campaigns for QR codes launched the British tabloid "The Sun", who advertised its new mobile service for advertisers. Famous model Keeley Hazell, who was dressed in a bikini, kept a huge QR code and this advertisement attracted the attention of the world, not just the English public. Furthermore, the "New York Times" used QR codes to promote their mobile site for monitoring the presidential election.



Figure 2. QR code which launched "The Sun" [9]

Fashion houses and sports equipment manufacturers, also started to use this technology for direct contact with their customers. Big international houses have special contents for the football lovers. Jerseys of the England football team, made by UMBRO, have code on the label which

took fans to the mobile site with exclusive information about English football. On the other side, website nikefootball.com used QR code for promoting its mobile site, which indicates where visitors can upload games, video clips and ring tones for mobile phone.

In addition, beside commercial use there are many ways to use QR codes as the holder of information. Surely, one of possible areas for implementing is in tourism. For this purpose, tourist experts can use table that indicate visitors to the monuments, important buildings and historic sites. These tables could be used for setting the QR code to provide summary information about the location, while the codes on locations, allowed access to detailed descriptions with links to other similar sites. Historic buildings, such as museums and galleries with exhibits could be able to inform visitors about the specific work and its author. Popular restaurants can use QR code, too, to provide a quick insight into the daily menu and specialties of the house.

The greatest attention in the area of culture which used new technology has attracted the spot of the group Pet Shop Boys for the song "Integral". This song has a strong message and it was written as a form of protest against ID cards, state supervision and control of citizens in England. During the video occasionally are displayed QR codes that linked to articles on this topic and it certainly served to pay attention to the video and the message it carries.



Figure 3. Capture from the video by Pet Shop Boys [8]

Popularity and usage of QR codes is bigger and bigger and according to that situation appeared new ideas for the implementation. One of latest ideas is printing T-shirts with codes that link to users Facebook profile or Twitter account. Therefore, Facebook offers an application that automatically generates the code to add a link among friends.

VI. SUCCESSFUL AGAINST UNSUCCESSFUL

A. *Successful Tesco's virtual stores*

The fact that becomes apparent is the growing use of smartphones that might actually increase the advantage of bricks-and-mortar stores, as it has been shown that consumers show greater interest in mobile services

related to places and things in their nearby surroundings. Last year, supermarket Tesco made an experiment with virtual shops on South Korean subway stations, targeting people who are waiting for train. This virtual shop includes plastered walls of the stations with pictures of groceries laid out as they were actually in a "real" store. These pictures contain QR code for every product that commuters can scan with their smartphones and fill up their virtual shopping basket. This experiment was very successful, because sale increased for 130 percent in a period of three months and thanks to this fact Tesco became number one online grocery store in South Korea.



Figure 4. Tesco Homeplus subway virtual store [6]

Success, which has brought the first virtual store, forced the experts from Tesco to think about new innovative moves. This year, in august, Tesco launched an interactive virtual grocery store at Gatwick Airport with the aim to help holidaymakers shop for their return using their smartphones. Gatwick travelers could avoid returning home to an empty fridge by scanning images of products, such as bread, milk, cheese, ham, water and chocolate with their smartphones.

What this service brings? Instead of empty fridge and going to shop, travelers just need to wait deliveryman to arrive while they unpack. Ken Towle, Tesco's internet retailing director, said: "It gives us a unique window into the future and the chance to try out exciting new concepts."

Tesco is just one example of how the online and physical worlds can successfully be merged into one. The aim is that there are countless opportunities that retailers can exploit in order to be successful in the future.



Figure 5. Tesco's virtual store at Gatwick Airport [5]

B. Unsuccessful Converse advertisement in Serbia

In Serbia is currently ongoing campaign conducted by the Converse brand, and provides a good example how not to run campaign which includes QR codes. The question is what's wrong? Converse is in its stores, more precisely, on the shop windows the same placed of QR. Size of posters with the QR code is corresponding, especially for scanning from longer distances. However, the first omission is made in positioning the code to the floor.



Figure 6. Converse shop window with the QR code [7]

However, this is not the biggest problem. The biggest issue is the content where QR code leads. When visitors scan the code, mobile device browser displays home page www.converse.rs which is totally unadjusted for the use on a mobile phone.

If Converse did not have enough resources to adjust the entire website and optimize for the use on the mobile phone, Converse should make an adjusted page for the use on mobile phones where would lead the QR code. Marketing experts would recommend that the most appropriate that page contain information about the current campaign and links to official profiles of the Converse in Serbia on social networks.

VII. CONCLUSION

We can conclude that the QR code has tremendous potential for powering business's web traffic. The QR code can be printed from just about anywhere, slapped onto just about anything, and turns into an instant and even permanent portal for people to visit company's website.

Important fact is that not everyone knows what the QR code is as opposed to traditional bar codes, but that will change too. This is going to become a popular gimmick because clever marketing experts are going to start implementing it.

It is good to mention that by the 2015th mobile internet traffic is going to be 400% more than it is today. That means that smartphones will become more commonplace and phone companies could start charging a lot more money to keep them up and running. At the end, the QR codes are an effective way to reach out to people and gain some mobile web traffic in the process.

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Social Implications and Social Values of Information and Communication Technologies

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Abstract - In this paper we address one of the most important aspects of using information and communication technology, social implications and social values. This paper discusses affect of information and communication technologies on many aspects of life. This technology transforms so many areas of life that its distribution influences the future distribution of power and opportunities. Internet has the potential to alter patterns of communication between individuals all over the world. Whether these changes will strengthen democracy and democratic values, or not, depends on the tangle of complex issues. In considering the connection between the Internet and democracy will be discussed availability of the Internet and freedom of expression.

I. INTRODUCTION

Information and communication technology brings many benefits, but also threaten some of the most important values, for instance security and privacy [1, 2, 3, 4]. This technology also changes concepts: ownership, buying and selling, right to possession, theft, justice in the distribution of resources and access rights [1, 2].

Key issues of application of information and communication technologies are: privacy, ownership the responsibility, freedom of speech, professional ethics, social implications and social values.

Undoubtedly there are benefits of new technologies, such as industry development, improved diagnosis and treatment of disease etc. We can also identify the damage caused by the use of new technologies such as the development of biological weapons, cloning, nuclear energy and waste chemicals that destroy ozone, the possibility of monitoring individuals without their knowledge, and eliminating the need for human contact.

We can think of the following issues raised by the use of new technology [5]: Is the use of computers compromised personal privacy? Whether computers should be used for all of what they are capable of? Over which forms of information technology should be a property? Who is responsible for the errors in the software, especially if we have catastrophic consequences? Is encryption prevents criminal behavior? Is virtual reality leads to introducing people to the world of fantasy?

With respect to freedom of expression on the Internet, in the case where the fantasies of torture, rape and murder related to the real and imaginary personalities, and can either be private and inaccessible to the public or even the

public and available to everyone, whether in this case the person is doing something wrong and if person could be arrested for what he has done in virtual reality? What happens if these fantasies in a virtual reality encouraged to crime? In accordance with the above, the question of whether there should be freedom of expression online?

Technology progress is inevitably, and with new advancement creates a vacuum in the new legislation, which is not always easy to deal with [6, 7]. New ethical questions that arise are: Is it ethical to set cookies on the hard disks of website visitors? Is it morally acceptable research data? Does domain on the Internet are distributed fairly? Who is responsible for the harmful the information that appears on the Internet? Is computer reconstruction should be used in court? Is it right for someone to electronically reproduce and modify someone else's artwork?

II. TECHNOLOGICAL DEVELOPMENT AND CHANGES IN SOCIETY

Identification and assessment of changes which bring information and communication technology is a very difficult task. It is important to at least try to understand technological developments and changes occurring in society. It is important to note the factors that influence technological development which leads to changes in society. In this way, we have an opportunity to direct the changes and to manage them.

Information and communication technologies solve some problems, and some problems are created. These technologies, especially the Internet, contribute to the expansion of the gap between rich and poor, both within countries and between countries.

Some questions that could be asked: Does this technology improve people's lives? Does reinforce or undermines important social values? Does it facilitates or inhibits democracy? Does this technology increase security or risks? Does the use of technology some individuals take precedence over the other? Do people lose control of their lives?

In the following text we will deal with the relationship between technology and social changes from a broader perspective. Three questions that could be asked are [1]: 1) What is a "social revolution"? 2) Does it come to changes or reinforces the status quo? 3) Is technology good or bad?

The first issue relates to the question of "social revolution." To social and technological change occurs constantly, so the big question is what is considered the normal evolutionary change, and what is revolutionary. Whether are concerned comprehensiveness, speed and type of change? According to some authors, social revolution means a change in the political structure and the distribution of power, by some other means a change in the way in which individuals think about themselves, for other it is related to the economic basis of society.

The most common mistakes that occur are mixing the social and technological changes and the assumption that all technological change leads to social change.

The second issue relates to the question of changing or fixing the status quo. Technological changes often perpetuate existing social patterns rather than to cause social change. There is concern that access to information and communication technologies and the Internet could do more to strengthen the dominant patterns of wealth and power. In support of this thesis Josef Weizenbaum [8] states: New York Stock Exchange and the military bureaucracy in the United States. At both institutions exerted enormous pressure to transform (after World War II in the U.S.). Weizenbaum said that the invention of information and communication technology came in the right time how these institutions remain unchanged. In the case of information and communication technology has not appeared in the right time, both institutions were forced to make radical changes.

The last issue relates to the question of whether the technology is good or bad. Is technology good or bad depends on the technology we use and the effects of which we think. Technology is incorrectly considered quite good or very bad, and its introduction is usually a mix of advantages and disadvantages.

Technology affects differently on different socio-economic classes, not the same for men and women differently affects different ages, different influences on groups engaged in different occupations etc.

The central idea of democracy is that political power should be in the hands of the citizens of a state and not a single person or a small group of people. In a democracy, citizens belongs the supreme power, and the government is accountable to them.

Before the Internet was not considered that technology is an important factor in the political organization. Today, there are several related arguments to support claims that Internet is democratic: 1) mediated interactions with many to many; 2) information is power, and 3) more power to those who are less powerful.

The first argument given which support the claim that Internet is a democratically is unmediated interaction with many to many people on the Internet.

An important argument about the democratic character of the Internet is that it allows anyone (who has access to the Internet) can discuss directly with anyone (who also has access to) without filtering. The Internet is democratic because: 1) It allows communication with many to many, and 2) communication can be done without the

intervention of institutionalized forms of communication, 3) Even when used for access to information institutionalized, it facilitates access to various sources, and 4) allows the establishment of new associations regardless of geographic location.

A second argument which support the claim that the Internet is democratic is that information is power. Democracy means that power is in the hands of many. Information is power, and the Internet allows individuals access to a huge amount of information. Therefore Internet is democratic.

Is any information is power? Information is power only when it comes to accurate and relevant information. Misinformation does not provide power. Wealth of information in which a man can't cope do not provide power.

Why is Internet democratic? Internet is democratic because information is power, and it also gives individuals access to information and allows them to be senders or those who provide information. Since Internet gives a lot of such power, it seems that it facilitates democracy.

The last argument given which support the claim that the Internet is a democratic is that Internet gives more power to those who are less powerful. Internet is democratic because it gives power to the less powerful. Internet removes all barriers to association, giving the power of those who were previously less powerful.

Summary of the previous arguments could be that the Internet is democratic because [5]:

- Facilitates communication with many to many people.
- Facilitates communication without intermediaries.
- Provides access to various sources of mediated information.
- Facilitate the establishment of associations independent of geographic location.
- Provides many individuals the ability to become receivers and senders of information.
- Provides power to those who are less powerful.

Internet can facilitate democracy, but not necessarily. Internet can facilitate the establishment of different values, but not necessarily. It can facilitate the establishment of hierarchical relationships, increasing the power of those who are powerful or to control and enslave the individual rather than to liberate them.

Communication with many to many has the following disadvantages:

- Communication with many to many often means chaos.
- During the conversation usually dominate the loudest and most aggressive.
- Our attention is usually attracted to those who have the most resources.

Creators of search engines on Internet filter, select and direct information. Search engines are a new form of institutionalized selection. We have no reason to believe that the search engines are democratic.

Internet communications are conducted through information and communication technologies. Information goes to certain nodes and from them to other individuals. Nodes are points of control or power. The flow of information in them can be stopped in order to control access to information.

Supervision over the Internet threatens democracy. People behave differently when they know they are being watched. While using Internet privacy level is very limited. Everything we do on the Internet will be permanently recorded.

Internet connects people, and geographic location loses importance. Our notion of democracy is based on the assumption of a common geographic area. Communication via the Internet undermines national autonomy.

Internet has the potential to alter patterns of communication between individuals all over the world. Whether these changes will strengthen democracy and democratic values, or not, depends on the tangle of complex issues.

III. INTERNET AVAILABILITY AND FREEDOM OF EXPRESSION

In considering the connection between the Internet and democracy will be discussed below availability of the Internet and freedom of expression.

Inequality in access to the Internet presents a serious threat to democracy. There is concern that information and communication technologies can deepen the gap between rich and poor and between the other layers of society. Democratic societies are committed to the idea that every citizen is equal under the law and the state, i.e. political equality. Political equality can't be completely separated from the social and economic equality. Social and economic inequality can lead to political inequality, why democratic societies need to take account of social and economic inequality.

Information and communication technologies represent a very powerful resource. Unequal access to such a powerful resource that can provide some individuals far more power than others, which is a threat to democracy. Information and communication technologies are a means and not a goal. They are tools - resources that help individuals and organizations in the acquisition of goods and achieving goals.

In the information society, idealistic visions of the position of the labor force are as follows: a job can be performed at home or laptop anywhere, work can be done whenever you wish, communicates by e-mail, mobile telephone or videoconference, regardless of time and place. The real dangers for the position of labor in the information society are: isolation from society, the exploitation of employees who work day and night and

forget the distinction between work and leisure; staff are available 24 hours a day, regardless of working time.

They do not have the same opportunities to find a job if there are no equal chances to qualify for the job. If access to education is not the same for everyone, then there are unequal opportunities. This technology is a powerful resource that enhances the quality of education. Therefore it is important to be accessible to poor schools and not just the rich schools. This technology enables the distribution of the same highly skilled knowledge to everyone. There are fears that, if distribution of information and communication technology among educational institutions, non-uniform, it will result in inequalities in future employment. Students who use this technology are better prepared for the job.

The Internet facilitates the exchange of information and the establishment of an association which is importance for political equality. On political decisions there is influence of the flow of information between government and citizens. However Internet can also increase the power of those who already have.

Each of these arguments is important. Together, they suggest an encompassing argument: information and communication technologies are unique in that they are useful in a comprehensive manner. Information and communication technologies affect many aspects of life. It is used in many different contexts to achieve different objectives. This technology transforms so many areas of life that its distribution influences on the future distribution of power and opportunities.

In the following text will be discussed freedom of expression. In the case of the Internet is difficult to restrict access to children, and not to restrict access simultaneously to adults. It is difficult to implement the laws of some countries that restrict access of certain forms of expression.

Censorship is a threat of freedom of speech, and freedom of speech limited by supervision. People do not feel free to express themselves when they know that all the say will be recorded. Capacity to monitor the Internet is to indirect conflict with freedom of speech.

Some questions to ask are [1]: How should we manage the Internet? As the autonomy of the state or local communities could be recognized in the regulations relating to the Internet? How can we avoid that economic interests undermine the potential of the Internet to serve the public interest?

Since Internet geographical location makes less relevant, issues of jurisdiction will post more. What laws apply to that activity and who is responsible for law enforcement? International jurisdiction issues are complex and are related to: property rights, standards of personal data privacy, illegal activities and etc. It's hard to keep the border when it is so easy to cross. In what circumstances are violated laws of a country? Which country has jurisdiction? Thus, the boundaries jurisdiction is likely to change, and these changes can have huge implications for the character of the national state and / or creation of new units of political, economic and social power [1].

Since more and more activities take place on the Internet, individuals will increasingly be dependent on institutions on the Internet. People will want to have some degree of confidence in those with whom they interact. Trust can be built through social, political and legal solutions to ensure the reliability, confidentiality and security. There will probably be creating a series of systems of trust and accountability.

Also, individuals are increasingly exposed only to what is already formed their circle of interest. Some individuals may increasingly determine the attitudes and prejudices that already have and have less in common with many people.

We can conclude that this technology, like any other, will not spontaneously bring the benefits and avoid the dangers. Each technology requires human supervision to be shaped and to be guided with it.

IV. CONCLUSION

Information and communication technologies are unique in that they are useful in a comprehensive manner. Information and communication technologies affect many aspects of life. It is used in many different contexts to

achieve different objectives. This technology transforms so many areas of life that its distribution influences the future distribution of power and opportunities.

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Research on Customer Attitudes Regarding Loyalty Programs

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Abstract - Increased competition in the market and increased customer expectations hinder business companies. The main focus of marketing is deflected to win new customers to retaining existing ones. The key to the success of modern business is a loyal customer, which is very difficult to accomplish. Focusing on the company's enduring loyalty is a prerequisite for successful business. In this paper we present an empirical study of the users of loyalty programs with the aim of determining their significance and to determine whether loyalty programs justify their purpose and company expectations.

I. INTRODUCTION

The basic rule of the concept of customer relationship management [1] is that "every customer is different." Customers are different and each has to be regarded as an individual and such a relationship must be built as well. Actions, behavior, attitude of the employees during and after the purchase create loyal customers.

The aim of the company's loyalty program is to "lure" customers for new purchases with various prizes, but a lasting relationship with the customer is not achieved only in that way. A large number of companies have similar, if not identical loyalty programs, and it may be that one customer is "loyal" in several places.

Product and service quality lead to customer satisfaction which leads to customer loyalty, and thus to the profitability of the company. Loyalty programs are used to reward and encourage loyalty but they are not sufficient to achieve true loyalty.

In marketing generally and in retailing more specifically, loyalty cards - lottery card, point card, or club card is a plastic card, visually similar to a credit card or a debit card that identifies the card and their users as members of a commercial incentive programs, loyalty programs [2]. Loyalty card (which can be in paper, plastic or electronically) is a relatively inexpensive marketing tool that helps the company to identify regular customers and reward them for their actual and projected purchases [3]. Loyalty card must collect and store information about the activities of their users such as number of collected points, the number of used points, type of payments, and so on. Based on this information companies can adjust their offers more precisely and with more success. Company orientation towards the customers is a key

TABLE I. PROJECTED RESEARCH SAMPLE

I KATEGORY	74 female participans younger than 40, that is 49 % of total research participants.
II KATEGORY	48 female participants older than 40 which is 19 % of total participants.
III KATEGORY	40 male research participants younger than 40, that is 21 % of total examinees.
IV KATEGORY	38 male examinees older than 40, that is 11% of total research participants.

aspect of the marketing concept. Customers are people who buy goods and services that meet their individual and family needs [4]. Customer loyalty card is used as a tool with which customers meet their needs. Therefore, the company that introduces loyalty cards and provides a variety of benefits to the users is focused on their wants and needs.

A. Research Methodology

Nowadays, winning and retaining customers is a big challenge for the company. The goal of every company is a loyal customer, and thus so much attention is given to the customers and their needs, desires and attitudes. There are various ways of acquiring and retaining customers, and one of them is, increasingly popular, loyalty card.

The case study refers to the analytical description of the connection between demographic characteristics of the customers and how they perceive various business deals and loyalty programs. The goal of this research is to identify consumer attitudes about loyalty cards, as well as their impact on customer loyalty.

B. Hypothesis

Starting from the knowledge that no consumer is the same and that, consequently, loyalty is very subjective; to facilitate quantification and analysis of the results in this paper we have performed grouping of the examinees.

Since consumers are different, there are different ways in which they perceive loyalty programs. An attempt was made to determine how and whether loyalty programs affect selected groups of examinees, whether they are loyal to only one loyalty program, and whether their decisions differ depending on gender and age.

C. Research Instrument

The study presented in this paper is based on findings obtained in the quantitative research by techniques of interviewing. The survey was conducted through questionnaires completed by the subjects themselves in hard copy on the spot. The survey consists of 15 questions, one of which was an open question (in the form of comments), 2 closed questions of simplest format (yes / no), and 12 closed questions with five answers, of which one is chosen, type:

- Always (during each purchase), often (average of three to four out of five purchases), occasionally, rarely (on average one to two out of five purchases), never (never);
- I was not satisfied, generally not happy, indifferent, I'm mostly happy, I am completely satisfied;
- In general it is not important, usually it is not important, indifferent, mostly it is important, it is very important;
- Completely false, partly false, I have no opinion / I do not know, partly true, absolutely true.

The questionnaire included questions about the demographic characteristics of the research participants such as gender and age that does not compromise their anonymity.

D. Research Sample

Projected sample included 200 examinees in the municipality of Subotica and includes people of both sexes, between twenty and sixty years of age. Defining the sample includes a group of respondents divided into categories, as well as establishing quotas for the given categories.

Subjects were randomly chosen in a retail store; a condition to participate in the study was that they have not participated in similar surveys in the past three months prior to this research. Also, the respondents had no previous knowledge of the specific case study.

With the analysis of demographic data, the total number of respondents was divided into four categories as shown in Table I.

II. ANALYSIS OF THE RESEARCH RESULTS

Analysis of the survey results show consumer response to the various loyalty programs, as well as differing views and opinions of the four categories of respondents.

The first poll question is: **Do you consider yourself as a loyal customer?**

Of the 200 respondents only 13 of them considered to be disloyal and 74 is in doubt and there is no concrete answer. 41% of respondents classified themselves into loyal customers. According to the survey, most loyal are men and women over the age of 40 with more than 50% of positive answers. There is a difference between the generations because people of both sexes under 40 years of age less loyal by half of people aged over 40.

The second survey question is: **Do you always shop at the same place?**

Only 6% of respondents did not buy at the same place, while 56.5% always or often do. 26.5% occasionally buy at the same place. There is a pattern behavior with the members of the first and third category because they have a similar percentage of the option and never ever. Judging by the results of the survey, men over 40 years, most go shopping at the same place (about 65% of this category, or frequently or always does).

The third question is: **Do you have a loyalty card?** Respondents could answer yes or no.

Of the 200 respondents, 141 have at least one loyalty card. Looking at all four categories the lowest percentage of positive responses was given by members of the third category, 50% of them have a card while 50% do not. According to this study 40 women out of 48 that are over 40 own at least one loyalty card.

At the fourth survey question: **Do you have more loyalty card?** - Respondents also answered with yes or no.

Of the 200 respondents 116 have two or more loyalty cards. Of all those surveyed only 25 have only one loyalty card which confirms the assumption that consumers are quite fickle and not loyal to just one company. 49 out of 74 women under 40 years of age have more loyalty cards, and only 5 of the 74 have only one.

The fifth survey question is: **Are you familiar with the benefits of your loyalty card?** The problem with the prevalence of loyalty cards is that consumers are not familiar with the benefits offered to them.

74 of 200 respondents were familiar with the benefits of their cards, and only 19 were not. 37 respondents were not sure. 50% of respondents in the first category were fully familiar with the program of their cards, and 30% of examinees from the third category were not fully or even partially familiar with the loyalty card program.

The sixth question poll: **Do you regularly collect points?** Regular collection of points increases the chance of creating customer loyalty and retention. Only 56 out of 200 always collect points while 59 never do. Men under the age of 40 collect the least, and women over 40 the most. 45% of women over 40 always collect points.

The seventh survey question relating to satisfaction and loyalty card is: **Are you satisfied with your loyalty card?**

Only 15 of 200 respondents were not satisfied with their loyalty card. 110 respondents fully or partially are satisfied with their cards. With loyalty cards the most satisfied are men and women over age 40 with more than 40%. 15% of men under age 40 are not satisfied with the card.

The eighth question is: **Are you loyal only because of the loyalty program?** The literature mentions that the loyalty program are only a loss for the company's because those consumers who use them, they are already their customers. This raises the question of whether the loyalty programs are effective in general...

The ninth question of the survey: **In the absence of the loyalty would you still shop there (here)?**

51 people out of 200 are not sure if they would have the same buying place if loyalty program did not exist, while 94 respondents partially or completely sure they would. Loyalty programs mostly affect men over 40 years because 21.05% are entirely sure that they would not shop there (here) if there would not be loyalty programs.

Some authors believe that more important than loyalty program is the atmosphere in which purchase is conducted (a relationship that is achieved with the seller, the facility etc...).

Tenth survey question is: **The atmosphere in which I shop is more important to me than the loyalty program?**

The shopping atmosphere is very important to men and women over 40 years because none of them has said that it is not important. All categories said that the atmosphere is important in their shopping-which was supported by more than 50% of respondents from all categories. 19 of 200 participants do not care about the shopping atmosphere, while 25 of them are indifferent on that influential factor. Women younger than 40 years are not loyal to the company because of the loyalty program (27.03%) and 24.32% had no opinion on the matter. 17 out of 48 women over 40 years of age are loyal to the company because of the loyalty card.

Eleventh survey question: **Do you think that the company that issues loyalty cards should follow their customer's purchases in order to customize their offers?**

More than 50% of respondents either partially or fully believe that companies should keep records of purchases by cardholders in order to create better deals for the most loyal customers. This is supported by all four categories of respondents.

The twelfth issue is linked with eleventh as it relates to the willingness of respondents to contribute companies to gather information in order to create personalized offerings for them. **Are you ready to give all the necessary information so that company can make specialized offers for you?**

Although 63 out of 200 respondents were with a firm view that the company needs to make additional efforts in order to offer specialized offers, and so reward loyal customers for their loyalty, only 44 are willing to

contribute to it. The least willing are members of the II and IV category.

Thirteenth question: **Loyalty cards are more useful to the companies that issue them than to consumers?**

Out of 200 participants 61 had no opinion on the issue, only 15 considered that this is absolutely true, and 29 that is completely untrue. Most skeptical on this issue were members of the third category, of which 30% is considered that this is partly true.

Fourteenth question: **Do you prefer discounts more than loyalty cards?**

44 of 200 respondents preferred discounts to loyalty programs, and comments that explain this reasoning was that with discounts they instantly receive a reward without effort in collecting points.

III. CONCLUDING REMARKS

Regarding loyalty programs there are some criticism. Managers in corporations, that refuse such a model of communication with customers, question the efficiency of the whole idea and justify it with a question: "Why additionally encourage customers to buy our products when they are going to buy them anyway?"

They, therefore, suspect that loyalty programs only bring losses and instead of them they insist that the money intended for marketing should be used to target new customers, through traditional forms of promotion. There is criticism on the issue regarding business ethics. It is said that loyalty programs are a form of marketing bribe, and that through coupons and points customers are being manipulated and are consciously and subconsciously encouraged to spend, even when there is no need. For example, the item is not particularly necessary, but it brings extra points, so they buy it.

From the perspective of non frequent customers, equal customer treatment can be questioned because loyalty-marketing offers a kind of bonus. Particular concern is the collection of personal data stored in corporate databases. It's no secret that this data is used for analysis in marketing planning for more efficient performance on the market.

Regarding loyalty programs we should always bear in mind that they are primarily designed to benefit those who organize them. Therefore, they should be treated as they deserve: as a small, casual benefit for consumers [5].

This study shows that loyalty programs are very popular with customers because over 70% of respondents own at least one loyalty card, while 58% have more. Over 50% of research participants are satisfied with their cards, and more than 40% are loyal because loyalty programs. The survey confirmed the fact that the atmosphere during a purchase also very important. Because of big competition and various loyalty programs of various companies, consumers are looking for "the whole package" and do not want to compromise the buying experience and in present market conditions, they don't need to. 78% of respondents said that during a purchase the atmosphere is partly or extremely important.

Customers want to be rewarded for their choices and their perceptions of loyalty and over 50% of respondents said they prefer discounts over loyalty cards. Based on comments the reason for this attitude is that with discounts they are "rewarded" immediately without any effort of collecting points.

Loyalty programs, if viewed only as a reward for customer, definitely justify its purpose. But customers will not be loyal only because of that, therefore companies need to turn to each customer individually and thus demonstrate that the customer is most important and not the profit obtained by his loyalty. Treating consumer as an individual a long-term relation can be created, on what consumers reciprocate with their loyalty, which in

the present is a much bigger prize than any rewards with what companies may reward loyalty.

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The Protection of Consumers From Unfair Terms in Consumer Contracts in the Legislation of the EU

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Abstract - The European Union gives great significance to the protection of consumers, as indicated by numerous acts which regulate this very dynamic area and which represent the framework for the coordination of all national bodies in the field of consumer protection. One of the determinant goals of the countries in this region is joining the EU. On this road, they are expected to include objectives and measures defined by the EU's common strategic documents in their domestic legislation and institutions. The issue of fairness conditions under which the supply of goods and services on the market is performed is an inseparable companion of the evolution of contract law. This paper emphasizes the views of Directive 93/13/EEC and its main goal of empowering and protecting consumers in contracts containing unfair clauses that are not individually negotiated. Whereas the laws of Member States relating to the terms of contract between the seller of goods or supplier of services, on the one hand, and the consumer of them, on the other hand, show many disparities, with the result that the national markets for the sale of goods and services to consumers differ from each other and that distortions of competition may arise amongst the sellers and suppliers, the importance of this directive is immeasurable. The purpose of this Directive is to approximate the laws, regulations and administrative provisions of the Member States relating to unfair terms in contracts concluded between a seller and a consumer

I. INTRODUCTION

The Member States of the European Union have long ago realized that a successful society is based on more than just a successful economy. Conditions also need to be created so that the individual can enjoy the benefits of such an economy. Many Member States had their own national legislations regarding consumer protection and their own policies on consumer protection. However, the differences between a large number of national legislations and policies regarding consumer protection posed an obstacle to the smooth functioning of the united EU market. This is why the EU initiated the creation of a joint policy on consumer protection, aiming to achieve the same levels of consumer protection in all Member States. The active role of consumers in the joint market is of crucial importance for the application of this policy. Chiefly, the consumers need to have the ability to freely

choose products and services of the best quality at the best price. It is important to note that the consumers need to have the same level of protection in all Member States of the European Union. Also, the products and services available on the European market need to be safe. The consumers need to have all the necessary information about the products, so that they can make the correct choice about their purchase [3].

There is a large number of regulations regarding consumer protection which are immediately applied by the organs of the EU. Apart from these regulations, there are also directives regarding areas for which the Member States have kept national jurisdiction. The European Commission has adopted the "EU Consumer Policy strategy 2007-2013." The vision of the Commission is to form a simple set of rules by the year of 2013, which will provide for an equal welfare of both consumers and sellers.

The European Union does not insist on a complete unification of rules regarding consumer protection, but only on respecting the minimum of their rights, which are prescribed by the mandatory directives and contracts. Therefore, it leaves open the possibility to judge the rights of consumers not only based on EU directives, but also on the national legislation of the said Member State.

It is important to note that an important aspect of the development of consumer protection is the realization of two basic goals: the raising and maintaining of a high level of consumer protection and the removal of obstacles in the free movement of goods and services on the joint market. Each of the Member States of the European Union needs to coordinate their national policies with the policies of the EU.

II. THE DEVELOPMENT OF THE DIRECTIVE

One of the most important directives in the area of consumer protection is Directive 93/13/EEC on unfair terms in consumer contracts, adopted on 5 April 1993, which applies to all contracts concluded after 31 December 1994. Ever since 14 April 1975, when the

Council Resolution of 14 April 1975 on a preliminary program of the European Economic Community for consumer protection and information policy was adopted, the initiative to provide consumer protection on a European level became apparent. One of the first significant documents in this area is the correspondence between the Commission and the Council on unfair terms in contracts concluded with consumers from 14 February 1984 published in the Bulletin of European Communities, which emphasizes the significance of the problem, the current state in the Member States and the possible solutions to this issue. Then, in 1990, a draft of the directive on unfair terms in consumer contracts was created, and its subsequent adoption by the Council is just the tip of the iceberg. Despite its flaws, the directive represents a step forward in the coordination of the laws of the Member States of the European Union. Article 9 of the Directive states that the Commission will deliver a report to the European Parliament and Council on the application of this Directive no later than five years after its entry into force. The same deadline has been set for the implementation of the regulations described by the Directive into national legislations, because it was considered that this time was enough to survey the positive and negative aspects of the Directive's implementation. The aim of this report is not only to evaluate 93/13/EEC, five years after the deadline for its transposition, but also to increase the number of questions aiming to improve the current state of affairs. According to the data of the Commission, progress has been made regarding the procedures for the protection of consumer's rights, market research, subsidies awarded in order to eliminate unfair terms in certain sectors of the economy, and improvement has been made in the dialogue between consumers and sellers of service suppliers. Relying on the experience gained by the application of the Directive in Member States, the report suggests a series of improvements. These suggestions mostly refer to its limitations, a list of unfair terms in the Annex of the Directive, the principle of transparency and the right to information. (Unfair terms, 2011) Directive 2011/83 of the European Parliament and of the Council of 25 October 2011 on consumer rights, amending Council Directive 93/13/EEC and Directive 1999/94/EC of the European Parliament and repealing Directive 85/577/EEC and Directive 97/7/EC has been amended with one article (8a).

III. A SHORT DESCRIPTION OF DIRECTIVE 93/13/EEC

The Directive opens with a preamble which states the reasons for its adoption, most importantly the establishment of an internal market which is impossible without the removal of the differences between national internal markets: the uneven positions of consumers and sellers upon contract conclusion, as well as the removal of discrepancies in the legislation of Member States. The Directive encourages market competition, which will provide a greater variety of choice to the citizens of the European Union in the role of consumers. Secondly, the

Member States must ensure that the contracts concluded between the seller of goods or supplier of services and the consumer contain no unfair terms, and that if such terms are used that they are not binding for the consumer, and that in such conditions the contract remains valid only if it is able to remain valid without the unfair terms. Considering that there is a danger that in certain cases the consumer may be denied protection which is in accordance with this Directive by determining that the law of a non-member state is to be enforced, it is stated that this Directive should include articles which prevent this possibility. At the end of the preamble emphasis is placed on the courts or administrative authorities of Member States which need to have at their disposal the appropriate and effective measures to prevent the continual enforcement of unfair terms in consumer contracts.

The aim of this Directive is to coordinate the laws, regulations and administrative provisions of Member States which refer to the unfair terms in contracts concluded between sellers of goods or suppliers of services and consumers. The contractual terms which reflect mandatory, statutory or regulatory provisions and the principles and provisions of conventions to which the Member States or the Community are party, particularly in the area of transport, are not subject to the provisions of this Directive. (Directive 93/13 on unfair terms in consumer contracts, Article 1)

The provisions of the Directive are applied to consumer contracts, in other words contracts concluded between sellers or suppliers and the consumer. The Directive is not applicable to employment contracts, contracts regarding inheritance and family laws, contracts regarding company law. Contracts regarding insurance and land contracts may come under the attack of this Directive. "Consumer" stands for any natural person who, in contracts covered by this Directive, is acting for purposes which are outside his business, trade or profession. It is the opinion of the European Court of Justice that a legal person may not be considered a consumer. However, the French Court of Cassation has in a number of its decisions reinforced its opinion that a legal person may qualify as a consumer, when the contract it is concluding is outside its profession [7]. However, there are cases when entrepreneurs and small companies, i.e. gas station owners, are negotiating with large oil companies, and those situations when a natural person who has specific knowledge in a certain field or has the ability to consult top experts in a certain field, when it is hard to believe that he needs protection in the process of negotiation. (Beale, Hartkamp, Kötz & Tallon qtd. in reference [7]) A „seller“ (of goods) and a „supplier“ (of services) stand for any natural or legal person who, in contracts covered by this Directive, is acting for purposes relating to his trade, business or profession, whether publicly or privately owned. (Directive 93/13 on unfair terms in consumer contracts, Article 2)

The Directive has a general clause which gives three criteria which must be cumulatively fulfilled in order for a clause to be qualified as unfair. These are: a

contractual term which has not been individually negotiated, which is contrary to the requirement of good faith, as well as a significant imbalance in negotiation positions. Since the general clause is abstract, difficulties can arise in the interpretation of these criteria. In order to avoid their different interpretation, the Directive provides an indicative list of unfair contract terms [8].

The Directive is not applicable to individually negotiated terms of a contract, in other words the contractual provisions whose content was determined by mutual agreement. On the contrary, the Directive is applicable only to those terms of a consumer contract which the seller, or service supplier, has not negotiated with the consumer. These contractual terms, whose content has not been mutually agreed upon, according to the Directive, are divided into: (1) standard, in other words general contractual terms, which the seller or service supplier has not specifically negotiated with the consumer and (2) the terms which the seller or service supplier has formulated in advance for the purpose of concluding a contract with a certain consumer. The first, general terms, are applicable to all consumers who join in a certain type of contractual relationship with a seller or supplier of services. The second, pre-formulated terms, are specifically formulated for a certain consumer, but their content was determined by the seller or service provider. Whenever a seller of goods or supplier of services claims that a standard term has been individually negotiated, it is up to him to prove this to be true.

The terms of a contract which is offered in writing to the consumer by a seller or supplier must be clear and intelligible. If there is doubt about the meaning of a term, the interpretation most favorable to the consumer will prevail. This rule is recognized by all legal systems, and originates from Roman law where it was known as “in dubio contra stipulatorem” or “in dubio contra preferentem” and means that an unclear clause in a contract will be interpreted in a way which does not favor the party which has drafted the contract. This rule is not applicable in procedures for the protection of the collective interests of consumers. Member States must ensure that unfair terms of a contract concluded with a consumer by a supplier or seller, as provided for under national law, are not binding on the consumer, and that the contract under these terms remains binding if it is capable of remaining in existence without the unfair terms. Establishing an absolute nullity is best suited for this purpose, since it is the opinion of the European Court of Justice that the domestic courts of Member States are ex officio bound to investigate the fairness of terms in consumer contracts which are brought before them, as well as that consumer rights in this sense do not fall under domestic rules on limitation [7]. Member States must take the necessary measures to ensure that the consumer does not lose protection provided by this Directive, by virtue of the choice of the law of a non-member country as the law applicable to the contract if the latter has a close connection with the territory of Member States. (Directive 93/13 on unfair terms on consumer contracts, Article 6).

Member States must, in the interest of consumers and that of competitors, ensure adequate and effective means for the prevention of continual use of unfair terms in contracts concluded between sellers or suppliers and consumers. These means include provisions whereby persons or organizations, which have a legitimate interest under national law in protecting consumers, may take action under the said national law before the courts or before competent administrative bodies, for a decision as to whether contractual terms drawn up for general use are unfair, so that appropriate and effective means can be applied in order to prevent the continued use of such terms. It refers to actions for the protection of collective interests of consumer which can be taken against individual sellers or suppliers of services, as well as against several sellers or service suppliers at once, as well as their associations which recommend or support conducting unfair terms in contracts with consumers [7]. With due regard for national laws, legal remedies may be directed separately or jointly against a number of sellers or suppliers from the same economic sector, or their associations which use or recommend the use of the same or similar contractual terms. (Directive 93/13 on the unfair terms in consumer contracts, Article 7)

A. The fairness of contractual terms which determine the subject of a contract

Because “unfairness” is defined by an abstract general clause and a gray list, full legal security is not guaranteed. Hence the Directive lists additional criteria which can help identify an unfair contractual term [5]. The unfairness of a contractual term is determined by the consideration of the following: the nature of the goods or services for which the contract was concluded at the time of its conclusion, all other circumstances attending to the conclusion of the contract and all other terms of the contract or of any other contract on which it is dependant. The assessment of the unfair nature of the terms will not relate either to the definition of the main subject matter of the contract or to the adequacy of the price and remuneration on the one hand, as against the services or goods supplied in exchange, on the other, in so far as these terms were drafted in a clear and understandable way. It was considered that the subject of the contract and the price should be left up to the free market competition, and not the control imposed by the Directive, therefore in cases when the consumer has overpaid for the goods or services, by an explicit term of the Directive, he cannot refer to the Directive. (Baretić qtd. in reference [5]). This is how the principle of good faith has imposed some very difficult demands on judges, who have to weigh the interests of the parties involved extensively in every case, and who will inevitably come to different conclusions.

B. The list of contractual terms which are considered unfair

The Directive has only one Annex which contains an illustrative indicative or an open list of general terms in

consumer contracts. It enumerates seventeen terms which the court, depending on the conditions of the case, can deem unfair, and hence invalid [2]. Science disagrees on whether the list of clauses has the character of a forcing “minimum gray list” or if it should just serve as an example. The final clarification was given by the Court of the EU when in the case of the Commission v. Sweden it termed the list an “exemplary and indicative list”. In his closing the Attorney General Geelhoed concluded that the list does not have the effect of an assumption, but an “illustratively-indicative” effect. This case solved another of science’s discussions about the obligation of Member States to implement the list of unfair terms. The list itself is not based on a system, so a different way of grouping terms is possible, while the given grouping suggested by van Gool seems to be the most acceptable, which groups the 17 excising terms into 5 categories: 1. Banned terms regarding the conduction of contracts and their unilateral alteration; 2. Banned terms regarding the limitations of consumers in cases of poor performance; 3. Banned terms regarding the limitations of the sellers obligations; 4. Banned terms regarding the termination of the contractual relationship and 5. Banned terms regarding regulations on possible litigation [6].

C. The principle of minimum harmonization

A larger number of directives regarding consumer protection belong to the group of the so called “minimum harmonization directives”, which means that they allow for a national legislator to adopt a higher degree of protection than that which is prescribed in the directive, by adopting national regulations. The differences in national regulations of Member States, a result of the said principle, endangers the trust of consumers, which questions the creation and functioning of the internal market, so the institution of the EU are trying to overcome the problem of minimum harmonization by adopting the opposite principle, from which the Member States cannot digress [8]. Directive 93/13/EEC foresees the technique of minimum harmonization (Article 8). Namely, it would be very difficult to adopt general regulations of the EU which would be able to replace national regulations. Member States were left to decide how to best implement the Directive into their domestic legislation. The laws regarding consumer protection need to be clear in order for them to be understood and used correctly. The countries which have „simply“ transcribed the regulations of the Directive and inserted them into the pre-excising regulations of their own legal system have reduced the practical value of the regime as a whole. (Weatherill qtd. in reference [8]) Directive 2011/83/EEC changes Directive 13/93/EEC and adds to it Article 8a, which states that when a Member State adopts regulations in accordance with Article 8 (which refers to minimum harmonization), it needs to notify the Commission, as well as if making any subsequent changes, especially if the regulations changed refer to the broadening of the Directive’s application or if changing the regulations which have been individually negotiated or to regulations about adequate price and reimbursement. This obligation regarding notification also refers to the lists of terms that

will be considered unfair. The Commission will ensure that this information is easily accessible to consumers and seller and suppliers, among others, and available on a special web site. The Commission delivers this information to other Member States and to the European Parliament. The Commission will consult interested parties about this information. Associate members of the EU have the obligation to harmonize their law with those of the EU, creating legal norms which are compatible to EU laws. For Member States, however, strict rules and sanctions apply. The adoption of the Directive is under the control and sanctions of the European Court of Justice [4].

D. The definition of unfair terms

The most important legal source regarding consumer protection in the EU, which determines the principle of good faith, is the above mentioned Article 3 Paragraph 1 of the Directive. In order for a term to be “unfair” it needs to 1. not be individually negotiated 2. cause a significant imbalance in the rights and obligations of the parties arising under the contract, to the detriment of the consumer and 3. is contrary to the principle of good faith.

The Directive refers to clauses that have „not been individually negotiated“ which could lead to the interpretation that the Directive is applicable to all contracts, since it is unimportant to consumers whether the contract is a pre-printed one, or if such a clause is found in a simple non-standardized contract. The focus is placed on a significant imbalance between the rights and obligations of the parties involved, and this imbalance can exist in both cases. Nevertheless, this situation is much more common when it comes to standardized contracts, so the regulative of the Directive which states that a clause will always be considered not individually negotiated if it has been formulated in advance, meaning that the consumer was not able to influence the content of the clause of a pre-formulated contract, does not come as a surprise. So then, unfair clauses mostly arise in standardized, adhesive contracts or in general business terms on which the consumer has no influence.

The general clause which points to good faith and a „significant imbalance“ are the most important parts of the definition of the unfairness clause and surely most difficult to interpret. Doctrine examines the term „imbalance“ by examining the facts of a concrete case taking into account the relation of rights and obligations of the parties involved. Here it is important to examine the core of the contract, the substantial terms and see if the contract can survive without that term [5].

The next criteria which needs to be fulfilled is the good faith criterion. Since there is no unique definition, the preamble of the Directive provides additional criteria for interpretation. It states that in examining the violation of the good faith clause particular regard shall be paid to the strength of the bargaining positions of the parties, whether the consumer has had an inducement to agree to the term, and whether the goods or services were sold or

supplied to the special order of the consumer. Because of all this, the list of unfair clauses provided in the Annex of the Directive, which illustrates what is considered a breach of good faith, will be useful to a judge [1].

IV. CONDITIONS IN SERBIA AND NEIGHBORING COUNTRIES

The obligation of coordinating the national legislature with that of the EU demands the coordination of Serbian law with the segment that refers to consumer protection in the EU. The result of this is the adoption of the Law on Consumer Protection in 2010. ("Official Gazette of the Republic of Serbia", no. 73/2010). The new Law on Consumer Protection was adopted in 2010, and has come into force on 1 January 2011. The main goal of the adoption of the Law on Consumer Protection of 2010 was an adequate protection of consumers, as the economically weaker party, from the abuse of power by the stronger party – the companies with whom the consumer conducts contracts. The fifth chapter of the law is dedicated to unfair terms in consumer contracts. The law adopts the term of unfair terms in consumer contract from Directive 93/13/EEC, while additionally broadening the definition of the term given in the directive. The law emphasizes the obligations of the public regarding contractual terms, stating that they must be clearly defined, and stated, so that a consumer with an average knowledge and experience may understand them. It should be stated that the problems of unfair terms have been defined even before by the Law on Obligations, so that the terms of the Law on Consumer Protection are in a *lex specialis* relationship with the Law on Obligations. Neighboring countries have also implemented these terms into their national legislations.

V. CONCLUSION

Is the principle of freedom of contract, and its implications, today a myth or a reality? The principle of freedom of contract has suffered larger or smaller constraints during the history of contract law, but was never absolute. It is opposed by the idea of contractual justice which refers to the inequality of contractual parties. The sanctioning of unfair terms represents a manifestation of the idea of contractual justice in the field of laws on consumer protection.

The goal of Directive 93/13/EEC is the removal of the differences in legal regulations on consumer protection of different Member States, which pose obstacles to free trade and hurt market competition. At the same time, the implementation of the Directive into national legislation will increase the trust consumers have for companies which value the rights of consumers and will help them solve the problem of disloyal competition. An efficient implementation of the policy on consumer protection is one of the priorities on the road to the European union. Adopting adequate regulations will aid the establishment of free competition on the market, the protection of the

interests of consumers, a faster economic development and an increased attractiveness of national markets for foreign investments.

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PROFESSIONAL PAPERS

„Start-Stop“ Parking Charge System - Linux/Smartphone Based Pay Parking By Minute System

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Abstract – This is a presentation of a payment system for open parking lots. The system is designed to collect payment for effective parking time. Parking payment can be calculated in minutes. Also, this system can provide complete automation of parking payment using GPS vehicle tracking.

I. INTRODUCTION

This paper shows a method of solving the problem of parking charges at “open” parking lots in Novi Sad. Open type parking lots are those found along boulevards and streets through which the traffic runs uninterruptedly. The most common method for collecting payments is through mobile SMS (Short Message Service).

The idea was to make a system that will allow parking users to pay effective parking time. Users can use this system via Smartphones or Internet portal, also the requirement for this system was that it must accommodate the legacy payment systems.

II. „START-STOP“ PARKING CHARGE SYSTEM

A. System Description

Parking users must initially go through a registration process, during which the users will provide all relevant information. Contracts will be generated automatically. After signing the contract, user account is activated and users can use the service through username and password. If the user wants to use the service via Smartphone application, users must install a Smartphone application.

On the arrival at the parking lot, a user can run Smartphone application by entering a username and password. Username and password are then saved for future use. After successful login, the user chooses the parking zone (Figure 1.)

After successful selection of parking zone, the user will enter vehicle registration number. Vehicle registration number can be saved in application. The maximum number of different registrations that can be saved in application is five (Figure 2.).

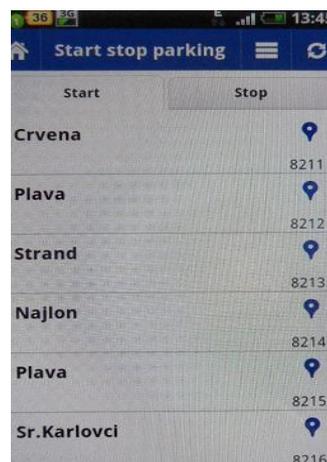


Figure 1. Choose parking zone

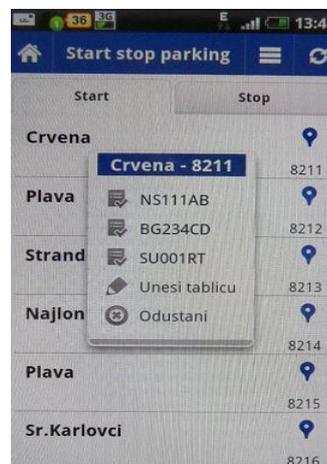


Figure 2. Choose license plate

After entering vehicle registration number, the user will receive the following informations (figure 3.):

- vehicle registration number
- date and time of starting parking transaction
- parking transaction ID number
- selected parking zone

- maximum allowed time (for the parking zones with time limitation)



Figure 3. Information message – „Start“

Through Smartphone application, users can park multiple vehicles. When the user wants to end parking action, he/she should select the tab “Stop” in Smartphone application and the list of all active parking sessions will be displayed (Figure 4.).

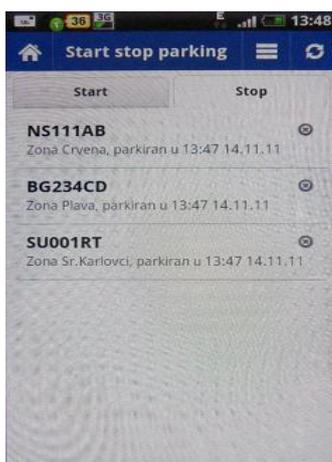


Figure 4. Tab „Stop“

The user will end parking transaction for a vehicle, by selecting a license plate. The user will then receive information about terminated parking transaction (Figure 5):

- vehicle registration number
- parking transaction ID number
- parking duration in minutes



Figure 5. Information message – „Stop“

System can also be used by WEB portal at <http://startstop.parkingns.rs>. Logging in using the username and password, the parking transaction can be started or stopped and there is also an option of reviewing all terminated parking transactions (Figure 6.).

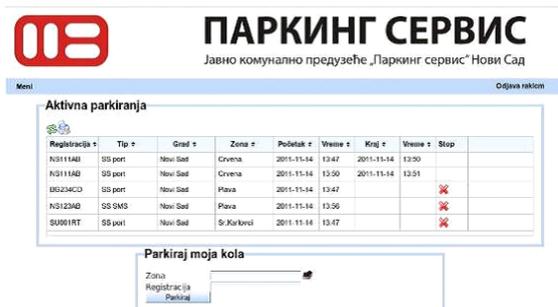


Figure 6. WEB portal

Every transaction that is started by Smartphone application can be stopped by WEB portal, also all transactions started by WEB portal can be stopped by Smartphone application.

If the user forgets to cancel parking transaction, the transaction will be automatically stopped after 24 hours. The user will be charged only for the time that is within timeframe of working hours for parking zone.

B. Technical Characteristic

The solution is based on the Ubuntu Linux operating system. Smartphone application is developed for Android operating system, but there is also Java version for Symbian, Blackberry and other mobile phone operating systems.

Server side software is developed in Java and application is running on JBoss application server. All transactions are stored in relational database PostgreSQL.

C. *Billing And Collection*

At the end of the current month all minutes used in different parking zones will be summed up and rounded to hour (first bigger). This is necessary because the zone pricing is defined by hour and it can not be divided.

Billing for this service is performed once per month by emailing invoice to the user. The user obligation is to pay this invoice in the same way as the bills for other communal services.

D. *GPS parking*

Combining previously described “Start-Stop” system for parking payments with widely used GPS vehicle tracking system, we developed GPS Parking System. Existing users of the “Start-Stop” system can install GPS vehicle tracking device in vehicles and start using GPS Parking service. The users of GPS Parking service will not bother any more with parking payment and every parking session will be calculated in minutes. When vehicle is stopped at a parking lot, the GPS server will automatically start the parking session. When the GPS server detects that vehicle moved, it will stop parking session.

III. CONCLUSION

By introducing “Start-Stop” system for collecting parking payments, we enabled users to pay the actual time (in minutes) for parking. A disadvantage of this system is that the user must go through a registration process, but this is one time process.

Additionally, great advantage for JKP “Parking Servis” is that using this system there are no GSM operators involvement in collecting parking revenue. Currently, using SMS parking system there is significant involvement of GSM parking operators (5%-7%).

“Start-Stop” system is running parallel with SMS parking system, so it is not necessary for users to change there habits. This is just another option for parking payment and it is completely independent.

Introduction of this service has not led to reduction of parking revenue for JKP “Parking Service” (although users pay an effective time) but there is significant increase of end user satisfaction, because the end user will pay just for the actual parking time. Also by introducing to GPS parking system the user does not need to perform any action by arriving on parking, everything will be performed automatically.

Mobile Banking

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Abstract: Mobile banking represents the Internet banking service used on mobile phones, but also the usage of SMS (short message service) in communication between client and bank. Mobile devices, the most common used mobile phones, PDA and portable computers (laptop) are used for account balance checking, transactions making, payments etc. Participants in mobile paying service include: mobile providers, banks and other financial institutions, traders and customers. According to analysts' forecast, during the next few years a number of mobile phones and other devices with Internet access will exceed the number of computers connected to the "network of networks". It is also forecasted that the growth of mobile trade and banking will achieve multiple fast growth than the growth of e-commerce and e-banking.

Mobile payments have previously been done by SMS exchanged between clients and bank. Development of Wap standard it provided Internet access using mobile phone and allowed the usage of all Internet banking services. This implies that clients may use their mobile phones and Internet connection to access their bank accounts. The huge benefits of this service come out of the fact that clients have lower costs paid for the service used because users only pay for Internet protocol made at their mobile service provider. Also the service is available everywhere 24/7.

INTRODUCTION

The purpose of this written work is to use concise, complete and understandable manner to indicate position, role and importance of mobile banking in the direction of more efficient operations and gain competitive advantage of banks. More increasing deregulation in the banking sector, as well as the increasing importance of information and communication technology has led to the introduction of new distribution channels for banking services and mobile banking.

With the advent of new media in the form of the Internet, the traditional payment systems were adapted and customized functional conditions in cyber space. Generally, we can say that the increase in demand for reliable systems on the Internet is conditioned by the action of three factors. Globalization comes in the first place. People around the world are increasingly eager to trade with each other, which in today's distance is almost

inconsequential. Next factor seems more pronounced caused by competition in the money market, which has never been more intense. Banks and other financial institutions are continually trying to reduce costs of transaction, especially in the present conditions in the flexible legislation. Finally, as a consequence of the growth of trade on the Internet and the number of executed transactions, logically there has been an increased need for people trusted payment methods.

The paper also analyzes the formation and development of mobile banking, also then analyzes the types of mobile banking with special consideration on SMS and WAP banking. The emphasis is on safety and the use of mobile banking the way it is achieved and under what conditions.

1. THE CONCEPT, FORMATION AND MOBILE BANKING DEVELOPMENT

Mobile banking represents one of the latest trends when it comes to e-commerce. It allows executing transactions via mobile phones, personal digital assistants (PDAs) and laptops. The traditional way of doing business when it comes to banks, was related to this, the clients had to go to the bank counter to be able to complete a transaction, to know the state of their accounts and to obtain relevant information. This is a problem because the bank's clients in this way spend their time and money. Introduction of mobile phones in the business allowed performing tasks faster and with less costs. All the jobs that required going to the bank counter can be made using a simple device, the mobile phone. It all led to an increase in customers' loyalty and increase employee productivity.

All mobile phones today have the Internet access, so customers can connect with their bank and execute the desired transactions. There is a problem in the Republic of Serbia, since the internet on mobile phones does not have satisfactory quality, especially in the area of 3G technology. Serbian mobile banking service is at the beginner stage, and the most common use is based on SMS (Short Message Service) service. Holders of such

mobile phone have this application in everyday use, but it is rarely used for business purposes. Banks have realized that these applications are often used, and it can be used to facilitate business. The main advantage of SMS is their widespread in use and simplicity. In this way, users will not need to be trained, because they already know this application very well. Through SMS service, customers have the option to check the balance on their account anytime and from any place. The bank sends reply message to the customer in the form of SMS. This whole procedure can be carried out via a mobile phone, which is now an unavoidable gadget when it comes to business.

The main advantage of mobile banking is that customers are not required to go to the bank counter, as it was in the case of e-banking. It is believed that mobile banking provides a quick and efficient operation, customer convenience, low cost price of services, then the ease of use and relatively low investment.

Besides to these advantages mentioned there are some disadvantages. First of all, a limited number of characters that can be sent via SMS, possibility of sending unstructured messages successful sms sending may depend on network workload. Absence of standards established can appear as one of the potential problems, and the existence of client's uncertainty to send private data over the cellular network.

If we analyze the relationship between mobile banking and internet banking with the conventional banking, it can be seen that mobile banking is more expensive than internet banking and cheaper than traditional banking (working with branches). The reason is that the Internet emerged and evolved before mobile phones, so its costs are lower. Today are more and more types of mobile phones, and mobile operators. Competition in this field is expressed, therefore all strive to give our customers more options.

Channel	Costs per transaction
Mobile banking	0,5\$
Internet banking	0,01\$
On – line banking	0,15\$
Home banking	0,5\$

Table 1. Costs per transaction¹

It can be expected that future of mobile banking will become more popular than Internet banking, primarily due to lower SMS prices and lower prices of Internet service. The way this kind of business has risen in importance is the fact that the number of branches in

¹ <http://www.frost.com/>, preuzeto 12.09.2011.

the U.S., declined to about 2000 in the past fifteen years.

Merita North Banken was the first bank since 1992. year offering some form of mobile banking services to its customers. Already 1999. year about 90% of the banks in Europe offered some form of mobile banking. Leaders in this field in the U.S. brokerage firms such as DLJ Direct, Fidelity, E-Trade, MSDW Online i Ameritrade, offering the possibility of a complete brokerage via mobile phone (starting from the value of the shares to the offer and verification of trade through mobile devices) .

Users in Singapore can make balance inquiry on their bank account, carry out the transfer of money from one account to another and to make payments. It is interesting that within the area of mobile banking Scandinavian countries and the Netherlands are currently far ahead in comparison to the UK and Germany.

2. THE TYPES OF MOBILE BANKING

There are two major software platforms on which are based banking services in mobile banking such as applications based on SMS services and applications developed as special software users install on their mobile devices through which they can then connect to the mobile Internet via their mobile provider (providers of mobile telephony services).

2.1. MOBILE BANKING

SMS banking is a type of mobile banking, a technology-enabled service offering from banks to its customers, permitting them to operate selected banking services over their mobile phones using SMS messaging.

SMS banking services are operated using both push and pull messages. Push messages are those that the bank chooses to send out to a customer's mobile phone, without the customer initiating a request for the information. Typically push messages could be either Mobile marketing messages or messages alerting an event which happens in the customer's bank account, such as a large withdrawal of funds from the ATM or a large payment using the customer's credit card, etc. (see section below on Typical Push and Pull messages).

Another type of push message is One-time password (OTPs). OTPs are the latest tool used by financial and banking service providers in the fight against cyber fraud. Instead of relying on traditional memorized passwords, OTPs are requested by consumers each

time they want to perform transactions using the online or mobile banking interface. When the request is received the password is sent to the consumer's phone via SMS. The password is expired once it has been used or once its scheduled life-cycle has expired.

Pull messages are those that are initiated by the customer, using a mobile phone, for obtaining information or performing a transaction in the bank account. Examples of pull messages for information include an account balance enquiry, or requests for current information like currency exchange rates and deposit interest rates, as published and updated by the bank.²

The bank's customer is empowered with the capability to select the list of activities (or alerts) that he/she needs to be informed. This functionality to choose activities can be done either by integrating to the internet banking channel or through the bank's customer service call centre.

The convenience of executing simple transactions and sending out information or alerting a customer on the mobile phone is often the overriding factor that dominates over the skeptics who tend to be overly bitten by security concerns.

As a personalized end-user communication instrument, today mobile phones are perhaps the easiest channel on which customers can be reached on the spot, as they carry the mobile phone all the time no matter where they are. Besides, the operation of SMS banking functionality over phone key instructions makes its use very simple. This is quite different from internet banking which can offer broader functionality, but has the limitation of use only when the customer has access to a computer and the Internet. Also, urgent warning messages, such as SMS alerts, are received by the customer instantaneously; unlike other channels such as the post, email, Internet, telephone banking, etc. on which a bank's notifications to the customer involves the risk of delayed delivery and response.

The SMS banking channel also acts as the bank's means of alerting its customers, especially in an emergency situation; e.g. when there is an ATM fraud happening in the region, the bank can push a mass alert (although not subscribed by all customers) or automati-

cally alert on an individual basis when a predefined 'abnormal' transaction happens on a customer's account using the ATM or credit card. This capability mitigates the risk of fraud going unnoticed for a long time and increases customer confidence in the bank's information systems.

The lack of encryption on SMS messages is an area of concern that is often discussed. This concern sometimes arises within the group of the bank's technology personnel, due to their familiarity and past experience with encryption on the ATM and other payment channels. The lack of encryption is inherent to the SMS banking channel and several banks that use it have overcome their fears by introducing compensating controls and limiting the scope of the SMS banking application to where it offers an advantage over other channels.³

Suppliers of SMS banking software solutions have found reliable means by which the security concerns can be addressed. Typically the methods employed are by pre-registration and using security tokens where the transaction risk is perceived to be high. Sometimes ATM type PINs are also employed, but the usage of PINs in SMS banking makes the customer's task more cumbersome.

Most SMS banking solutions are add-on products and work with the bank's existing host systems deployed in its computer and communications environment. As most banks have multiple backend hosts, the more advanced SMS banking systems are built to be able to work in a multi-host banking environment; and to have open interfaces which allow for messaging between existing banking host systems using industry or de-facto standards.

2.2. WAP BANKING

WAP banking has emerged after SMS banking with the development of the WAP standard that enabled internet access through mobile phones. This means that the bank's clients are enabled, with the support of a mobile phones and online access, to access their bank accounts. Some authors use the term of mobile banking to imply directly WAP banking, while SMS banking is classified as a special banking service. Connection with the bank is carried out via mobile phone which has a built-in WAP device.

² http://en.wikipedia.org/wiki/SMS_banking, preuzeto 2.09.2012.

³ http://en.wikipedia.org/wiki/SMS_banking, preuzeto 2.09.2012.

To be able to use the WAP services of any bank, the user must have a mobile phone that supports WAP. In doing so, the user only pays for GPRS traffic generated by provider. Thus, WAP banking involves direct access to banking services via mobile internet or indirectly via specially installed programs (applications) in the mobile phone through which it connects to the mobile Internet.

Factors affecting the dynamic development of mobile business:

- Relatively small investments
- A simple device and easy to use
- Provides greater comfort while use.⁴

Using mobile banking service via mobile phone is a simple process. WAP banking is internet based banking service on your mobile phone. After registration, a user via SMS receives a confirmation of service registration, PIN code and user manual. Such system of mobile payments is extremely easy and safe as the user authorizes every transaction with their personal PIN. The user of the service uses mobile phone to establish connection to the Internet and enter the application. Within the application, the user is enabled to perform the selection of the bank's services (e.g. view account balances, making payments, view payment and disbursement by all accounts, depositing funds, purchasing checks, exchange rates, currency calculator, etc.)

Factors that slow dynamic development are:

- Uncertainty of consumers to send data over the mobile network
- Lack of uniform standards in this area.

3.SAFETY AND THE USAGE OF MOBILE BANKING SERVICE

Security is one of the most important demands of mobile banking, if not the most, since the lack of system security and reliability causes reduced level of users trust. Studies have shown that the on-line mobile and online banking users have lower level of confidence in the application security, and because this is a key problem and obstacle for further development of the banking services.

An effective way to protect data on the Internet is the applying of public key technique called PKC (Public Key Cryptography) which includes two keys (private and public) to be shared between participants themselves in communication. The third element is a digital certificate signed by a third party who is authorized to issue certificates.

⁴ Bjelić, Predrag. *Mobilni telefon kao kanal elektronskog poslovanja*, Ekonomski anali br. 151-2, oktobar 2001. - mart 2002. str. 95

The example of Erste Bank mBanking service

Now I'll show the mBanking service of Erste Bank in Croatia, which is one of the leading banks by implementation of the m-banking in neighboring country. This bank has offered everything to all users that are accustomed to online banking on mobile phones. This includes a review of the accounts and transactions, funds transfer within the bank and outside the bank accounts (including bill payment), deposit funds, order checks etc. In the term of transaction security, mBanking is something even more secure than transactions that are done by Internet. This solution uses the SSL protocol, as well as Internet banking solution, and additional safety is provided by the fact that operators encrypt GPRS traffic, and the extra security is provided. In order to use the service it is required to fill out the application and make the account or savings account at Erste Bank and then download a Java application on your mobile phone. In further the illustration will show the demo.

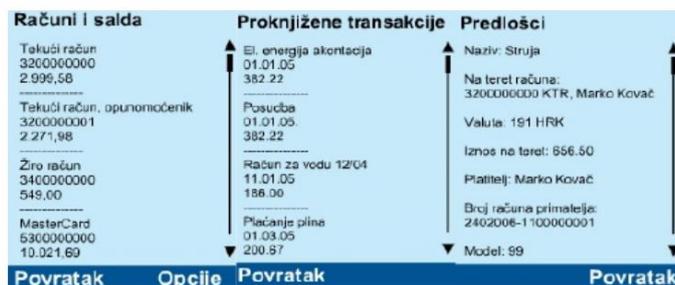


Picture 1. Review of Erste mBanking

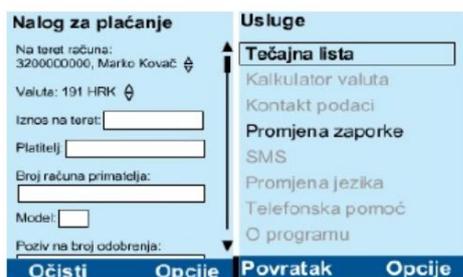
This presentation shows that it is possible to make a bill payment by making only 3 clicks under complete control, because at any moment it is possible to achieve insight into the balance. All this can be done four to five times cheaper than in the bank's office. Erste mBanking service provides the ability to view the current, transfer or exchange customer account, and then pay bills or transfer funds from one account to another or obtaining general information about bank services and exchange rate information, etc. Paying bills can be made by using the payment patterns done such as pay-

ment of electricity, water, telephone and mobile phone in just a few steps or filling in a payment order.

effect of the development of information technology is the increasing competition in the financial market.



As an external factor introducing mobile banking is surely more expressed need for cheaper services, easier access to bank's services and increasing customer knowledge about information technology and the opportunities it provides to simplify the performance of ordinary activities and time savings. Unlike traditional banking, in the modern electronic banking is less need for the number of employees and instead require staffing structure. It is necessary to invest in higher education personnel whose knowledge is not based only on the knowledge of traditional banking business, but recent trends in information technology and communications.



Picture 2. Display of Erste mBanking types

Erste Bank's mobile service banking, mBanking, regardless to the mobile operator each customer uses, allows for easy monitoring and management of all types of accounts opened at Erste Bank. Important requirements for this service use is having a bank account, completed registration ticket and a mobile phone. This is the m-banking service based on a JAVA software application that is supports by a lot of different types of mobile phones, and requires a previous installation on the mobile device and an internet connection via GPRS/UMTS.

Initial investment in infrastructure are high, but costs depreciate by the increase of the volume of transactions and also reduce the employees needs and the number of required financial positions or locations of counters and offices under the traditional banking business.

CONCLUSION

The development of information technology has enabled the transformation of traditional banking, which is based on the transmission of information in real time and data handling. Information technology reduce costs of information processing and communication, thus decreasing the price of services to end users.

Information technologies enable the formation of virtual banks with having no physical branches and whose needs for employees have been reduced to the minimum. They enable an increasing use of electronic money, which eventually opens up the possibility for the creation of non-banking institutions. The main

One of the most important steps in spreading of e-banking service is based on citizens education. It is necessary, at first, to thwart prejudice in users of electronic access, and then in terms of quality of existing solutions usage. There are two channels for education. First, that should be performed by the banks, each in their own way, thanks to the ability and internal school. Another channel is to get specialized media, as for example banker, economist, and so on initially focus on the people directly interested in the subject, then this information should be spread further to other media.

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PLANet System Group

Manuscript Archives

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Abstract - In this paper, the authors display an overview of Manuscript Archives, an online content management system, designed for managing scientific papers. In the first part of the paper, the history of the company that designed the system is outlined, along with its role in the birth of the Online Peer Review systems. The second part of the paper deals with the Manuscript archives system itself presenting the various aspects it offers. Integration, customization and accessibility to new users are the main features presented in this paper, with the intention of presenting new means of scientific publishing methods to the general public. Comparison is drawn with many online peer review systems, but in the sense of outlining the lack of an all-round content management system that deals with papers after they have been accepted, but before they are published, either online or in hard copy.

Keywords: Online Peer review, Scientific Publishing, Content Management Systems

PLANET SYSTEM GROUP

PSG is a privately held corporation founded in 1996 and headquartered in Charlottesville, Virginia. Our company develops and markets computer software products for a wide variety of industries and government organizations. PLANet Systems Group™ also provides consulting services relating to our products including in-house and on-site training, customer support and maintenance, and customized development. In 1996 PSG developed its first PLANet CRM Customer Relationship Management system, which provided Manuscript Management for the Peer Reviewing of Medical Manuscripts published in Medical Journals.

Since our inception, we have always worked with our clients to build custom solutions that afford the ability to quickly add functionality as needs require. 'Functionality breeds more requests', and we build systems that allow for quick application and integration of desired new functionalities.

PLANet Systems Group™ focuses on two core markets: custom development and implementation of our web based applications and the support for scholarly societies and journals in their peer review and production processes.

PSG has a proven history of success in the IT industry, especially within the domains of technical

expertise, service and products that are hard to match. Our team has years of experience in building applications, from dynamic on-line photo libraries, to dynamic content web sites of major magazines and from CRM Solutions for small to medium companies to big enterprise platforms designed to support providers of airline and cargo ground services.

PLANet Systems Group is dedicated to designing user-friendly applications and making your work easier, less stressful and much more enjoyable. Our applications are custom developed to meet your specific business needs and help you manage your daily operations more efficiently, while increasing your revenues and significantly decreasing IT cost.

PLANet Systems Group™ has been involved in online scholarly peer review and publishing from its very beginnings. During the early nineties, Dean E. Bedford, the principal founder of PSG, was the first to develop Manuscript Manager, one of the industry's first peer review applications while working as a developer for Carden Jennings Publishing. The first Manuscript Manager Peer Review Application provided manuscript management for peer review processes of manuscripts published in Medical Journals and served as a foundation of the widely successful Manuscript Central application, now managed and deployed by ScholarOne, a Thomson Reuters business.

MANUSCRIPT ARCHIVES

PLANet Systems Group (PSG) has recognized the rising need for a secure, fault tolerant and highly reliable archiving solution.

The Manuscript Archives Project encompasses PSG's excellence as custom programming professionals combined with our rich experience as an active provider of professional outsourced support services to scholarly societies and journals in their peer review and production processes.

Manuscript Archives platform uses the latest web technologies to fulfill the need to virtually store any amount of data securely and inexpensively, thus allowing

users to rest assured that any portion of the data stored will always be available when needed.

THE TECHNOLOGY

Manuscript Archives is a Software-as-a-Service platform with an extremely flexible and database agnostic core application. This enables Manuscript Archives to run on different databases and to quickly adopt a different data structure.

Manuscript Archives comes in three versions based on the storage type. Data can be stored either on PSG servers located in Dallas, Texas; in the Amazon Cloud; or we can run Manuscript Archives as an interface to the already existing client storage.

HOW IT WORKS

Integration with the client's web-based solution for online submission and peer review allows for easy uploading of manuscript files and the accompanying metadata. Manuscript Archives has already been set up to work with several Online Peer Review applications, with seamless integration achieved in just a few easy steps.

Manuscript Archives features an intuitive interface with a concise two-column layout, allowing for easy access to archived content utilizing an advanced smart search functionality based on all available metadata such as, Title, Manuscript ID, Keywords, Abstract, Authors, etc.

Despite the fact that it is a standalone web based platform, due to its user-friendly design, no additional training is required for your Journal Administrators.

You can locate and preview manuscript details in a snap with all of the accompanying data, and once there, the download of the archived manuscript package is just one click away.

FUNCTIONALITY OVERVIEW

Manuscript Archives can easily be set up to work with client's web-based solution for online submission and peer review of choice, with seamless integration achieved in just a few easy steps - allowing for easy uploading of manuscript files and the accompanying meta-data. Even though it is a standalone web based platform, thanks to its user-friendly design, no additional training will be required for any user level.

LOGIN

Manuscript Archives features an intuitive and concise user interface, allowing for easy access to the archives from a standard login page, with built-in lost password retrieval functionality. Due to password encryption and security reasons, the lost password retrieval requests provide users with newly generated secure passwords. [Fig. 1]

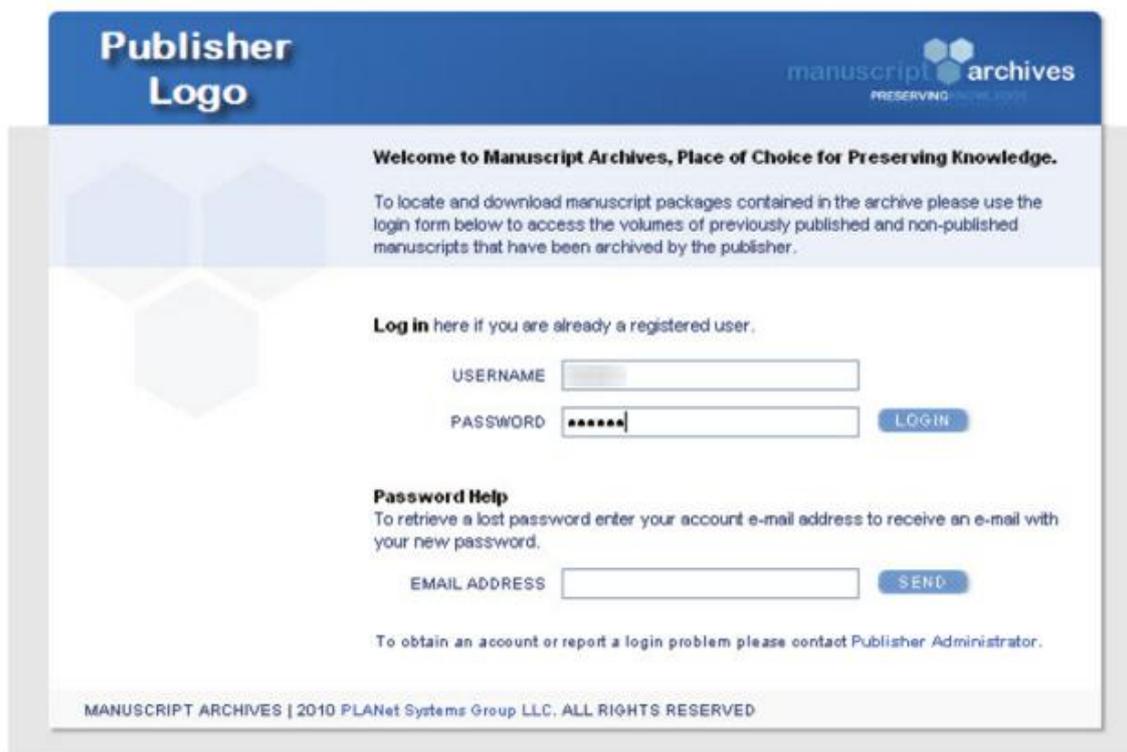


Figure 1. Login page

Manuscript Archives features an intuitive two-column interface: The left column encompasses the Table and Record Navigation Bar with the Record Data Area below. The right column contains the following functionalities (listed from top): User ID with the logout option; Data Sorting; the advanced smart search functionality based on all available Meta-Data such as: Journal Title, Manuscript Title, Manuscript ID Number, Authors, Keywords and Abstract; The ability to show all the records in the selected table or display the list of the previously filtered set of records obtained by performing a search. Admin

level users also have the ability to add new users to the system when working with the User table. At each point during the work with the MA Application users have the ability to seek support from the PSG Support and Development Team by either placing a direct Skype Call (provided that the user has Skype installed on his computer / more info at www.skype.com) or by sending an email request to PSG by clicking on the Service Center link at the bottom right corner of the Record Data Area and filling the form that will appear in a pop-up window.[Fig. 2]



Figure 2. MA Application Interface – Journal Detail View

The advanced smart search functionality has been built into the system to make navigation and locating of the necessary items very simple and intuitive. The search form allows searching through all available appended Meta-Data such as:

- Journal Title
- Manuscript Title
- Manuscript ID Number
- Authors
- Keywords, and
- Abstract

Users who have been granted permissions to access manuscripts from multiple journals have the ability to select one or more Journals from the drop-down menu by holding the Ctrl button while selecting appropriate Journal names to be included in the search. If the search

filters out a single manuscript as a search result, the user will be taken directly to the Manuscript Detail page.

USER ROLES

Three default user levels can be set:

Admin Level users: with access to all Record Data tables: Journal, Manuscript and User table.

Publisher Level users: with access to Journal and Manuscript tables.

Journal Level users are only granted with the permission to access the Manuscript table. By managing their

Journal access permissions, Journal level users can be granted three different access levels to Journals in the

system: an access to all journals, an access to only a limited number of journals, or with an access limited to Manuscripts belonging to one specific Journal.

CONTROL PANEL

Upon a successful login the user is brought to the application's default starting page – the Control panel. The items displayed in the Control Panel layout depend on the user level permissions. Admin Level users have access to all Record Data tables: Journal, Manuscript and User table:

Publisher Level users have access to Journal and Manuscript tables. Journal Level users are only granted with the permission to access the Manuscript table. User Management (Admin Level)

Administrators have the ability to add new and manage permissions of existing users through the User table accessed solely via the Control Panel layout. When in the User table the 'Insert New' link appears at the bottom of the right menu enabling Administrators to add new users to the system. A click on the 'Manage Journal Access' link at the user's detail page opens a pop-up window with the following instructions regarding the options for setting the appropriate access permissions for the user in question: All changes need to be confirmed by clicking on the Submit buttons, first on the Manage Journal Access page and then at the User detail page. Journal Preview (Admin & Publisher Level)

Journal Table list view displays the list preview of all journals archived within the MA application. The detailed preview is accessed by clicking on Journal name or the appropriate folder icon next to it. The detailed Journal preview page contains the following items:

- Journal thumbnail image
- Full and abbreviated name
- Description, relevant keywords
- ISSN numbers
- Total number of belonging
- archived manuscripts, and Preview portlet with a scrollable
- list of all belonging manuscripts, also affording the ability to access any of the listed manuscripts directly by clicking on the manuscript's ID number.

MANUSCRIPT PREVIEW AND DOWNLOAD (ALL USER LEVELS)

Manuscript Table list view displays the list preview of all manuscripts archived within the MA application and belonging to the journal or the list of journals to which the user has been granted the access to view and download from. The detailed preview is accessed by clicking on the Manuscript name or the appropriate folder icon next to it. The Manuscript detail layout features the prominent 'Download archive' button at the top of the screen, providing the user the ability to download the archived Manuscript package in a zipped format with all

of the supplemental files that have been archived together. Depending on the hosting plan the Client has chosen for the implementation of the MA application, clicking on the 'download archive' button will either initiate the direct download of the zipped archive (if hosted on PSG's or Client's own servers) or generate a unique, secure, expirable link for download (if hosted on the Amazon cloud). Based on Client Requirements we can provide the option for separate downloads of any of the supplemental files archived together with the manuscript. The Manuscript detail preview page also contains the following relevant information:

- Manuscript ID
- Title
- Journal name
- Authors
- Keywords
- Abstract
- File structure preview
- Date and Time of the archiving
- 'Archive Download Request Log'.



Figure 3. Manuscript List View

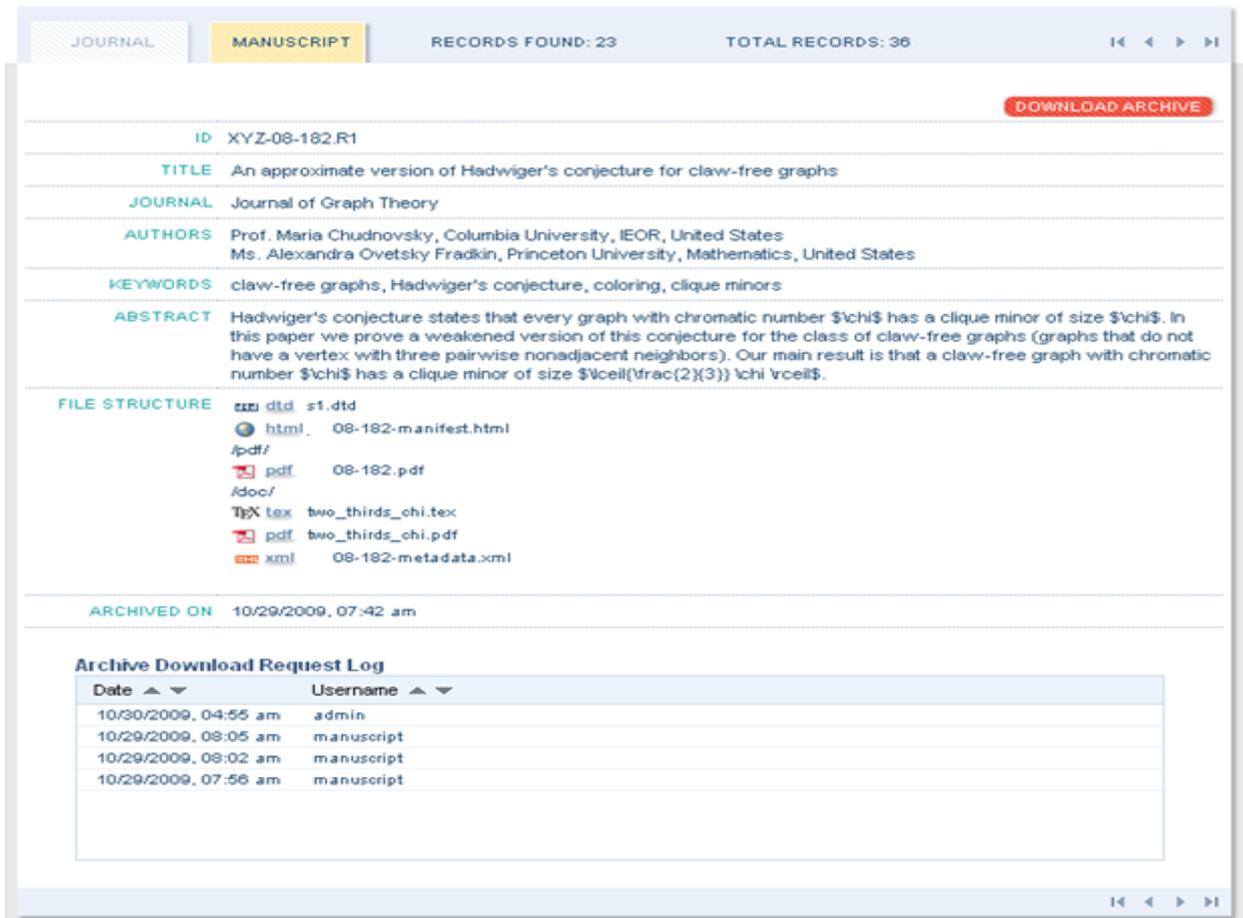


Figure 4. Manuscript Detail View

CONCLUSION

Manuscript Archives started out as a conclusive Archive management system but has grown into a far more stretching product. Today, Manuscript Archives represents an all-round content management system that allows users or all creeds from major publishers to editors to track and view all manuscripts that have ever crossed their journal. With seamlessly easy integration, through the use of the simplest FTP protocol, the process of archiving and transferring manuscripts can be automated completely, eliminating the need for excel sheets, folders and folders of unnecessary data. All the

information one journal contains is stored safely in one place, always accessible, no matter where in the world you currently may be.

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[http://www.planetsg.com/PLANet_Systems_Group_Web site/](http://www.planetsg.com/PLANet_Systems_Group_Web_site/)

