UNIVERSITY OF NOVI SAD
TECHNICAL FACULTY
"MIHAJLO PUPIN"
ZRENJANIN

ITRO**CONFERENCE** 9.0

INFORMATION TECHNOLOGY AND EDUCATION DEVELOPMENT

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ZRENJANIN, June 2018

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PROCEEDINGS OF PAPERS

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INTRODUCTION

Technical Faculty "Mihajlo Pupin" organized, now the traditional, IX International Conference on Information Technology and Education Development (ITRO 2018), which was held on June 29, 2018.

This year we managed to gather our colleagues, scientists, researchers and students from 10 countries (Serbia, Macedonia, Bulgaria, Bosnia and Herzegovina, Romania, USA, Great Britain, Albania, Montenegro, Slovakia). Many of them have been participating in the work of the Conference for many years and practically they are making an ITRO family. With their papers they managed to present and promote the results of research and scientific work in the field of information technology in education. More than 40 papers have been collected, which will be published in the Proceedings of the Conference website too (http://www.tfzr.rs/itro/index.html).

The main course in the work of the Conference was set up with introductory lectures in which the significance of following topics could be seen:

- Education for modern business and education from the perspective of employers nowadays when every company is directly or indirectly IT company – lecture with the topic "Digital transformation of the society – the role of education" was held by Goran Đorđević, director of the company Consulteer;

- Scientific research work in the field of information technology in education, whose results were published in one of the world's leading magazines – this novelty at the ITRO Conference was introduced by PhD Dragana Glušac with a lecture on "School without walls";

- The latest forms of education and practice of IT experts in the country and abroad – a lecture on the topic "Finding a space for "making" and digital fabrication in the education of Serbia" was held by PhD Dalibor Dobrilović.

The other presented papers have cast light on various aspects of contemporary education in our country and abroad, as well as on the experiences, problems, questions, etc. which are related to them.

The conference was an opportunity to connect again with researchers and scientists from other institutions and countries and ask questions about new forms of cooperation and projects that are relevant to all of us.

The conference was held thanks to the sponsorship of the Provincial Secretariat for Higher Education and Scientific Research, which also traditionally supports ITRO, as well as the Faculty, which provided the necessary technical conditions.

We thank everyone for participating and creating the ITRO tradition.

See you at the next ITRO Conference,

Chairman of the Organizing Committee

PhD Vesna Makitan

We are very grateful to:

Autonomous Province of Vojvodina

for donated financial means which supported printing of the Conference Proceedings and organizing of the Conference.

CONTENTS

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INVITED LECTURE

Finding Space for "Making" and Digital Fabrication in Serbian Education

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Abstract – **The upcoming challenges like growth of the world population, climate changes and social and environmental problems can threaten our civilization. Besides this, there is evident growth and development in the market of electronics and communications. For both reasons we will have to find the proper response. The response can be found in high quality science and mathematics. The question is how to achieve this. This paper describes one approach in creation of adequate and efficient educational system with possible implementation of „making" and digital fabrication in curricula.**

I. INTRODUCTION

The one of the major issues today is a growth of a world population. This directly influences some other issues such as famine, pollution, proper healthcare, etc. Global problems are climate changes, resource and waste management, the energy and water sources management, etc. On the other hand, nowadays like never before, we are witnesses of rapid development in electronics and communication industries and of rapid growth of technology usage. The widespread implementation of ICT technologies in all these areas requires increased number of IT experts in order to develop, implement, maintain and upgrade these systems.

In order to address the first group of problems, we need to use science and technology [1]. On the contrary, the researches show that there is evident trend worldwide in decreasing interests and motivations of pupils for science, mathematics, engineering and technology [1, 2, 3], in the same level in western countries, power Asian economies and in the rest of the world as well. Thus, the implementation of effective leaning methods with the usage of low-cost, easy-to-use, interesting and multipurpose learning platforms becomes very important and one of the key factors for efficient science education.

In order to achieve the goal, e.g. to establish

such learning practice we can use "making" and digital fabrication. In this paper is presented possible way to improve the education in the fields of science and engineering with the usage of those two principles. The situation in Serbia concerning this issue is presented as well. This research is based not only on the extensive scientific research and literature review, but also on the author's experience and university and off-academic activities.

This paper is structured like this: after the introduction, the explanation of "making", digital fabrication, STEM education and related issues such as open-source hardware are presented. Next, the hardware and software platforms designed for the usage in schools are presented as well. At the end, the short concluding remarks are given.

II. „MAKING" AND DIGITAL FABRICATION

The "making" as a term has its origin in the maker culture [4, 5, 6]. The maker culture can be considered as subculture that represents a technology-based extension of DIY (Do-It-Yourself) culture. The members of this culture are called "makers". Makers can be professional engineers and IT developers, but many makers are hobbyists, enthusiasts or students, in other word amateurs. Despite this fact, they can be innovators, creators of new products and they can produce value in the community. It is not unusual that some makers become entrepreneurs and start companies. No meter, if they are hobbits or entrepreneurs, amateurs or professionals, their work can result with the creation of new devices as well as enhancing existing ones. The maker culture in general has strong support in open-source software and hardware movement and in single-board computers (SBC).

The typical interests of followers of maker culture include engineering-oriented disciplines such as electronics, robotics, 3-D printing, communication technologies and automatic control tools. These disciplines are often combined

with metalworking, woodworking, and the traditional arts and crafts. Besides their skills and knowledge, makers also have great inspiration, imagination and willingness to share their knowledge and ideas within community and outside as well.

There are some specific characteristics of the followers of this movement. Makers encourage a cut-and-paste approach in development and creation and re-use of designs published on websites and maker-oriented publications. The maker's projects are published on number of sites, and anyone can reuse their schemas, codes and ideas.

Maker education [7, 8, 9] or education based on previously described subculture is term launched by Dale Dougherty in 2013 and it is closely associated with STEM learning. Science, Technology, Engineering and Mathematics (STEM) learning is an approach that used problem-based and project-based learning [10, 11]. This approach heavily relies upon hands-on collaborative learning experiences as a method for solving problems during the lecture and off-lecture activities.

"Makers" develop their projects at home or in makerspaces (development studios) which are designed and equipped to support prototyping (e.g. soldering tools, 3D printer, etc.), and have enough space for organization of meet-ups, workshops, courses, seminars and other meetings [12, 13]. Makerspaces can be established independently, but also in some institutions such as: schools, companies and associations.

The importance of maker movement and makerspaces is in their focus on collaboration and the free flow of ideas. Maker education involved in schools activities can burst the importance of learner-driven experience, interdisciplinary learning, peer-to-peer teaching and iteration. The failures, unsuccessful projects and mistakes are also the part of learning process.

Very close to the making movement is digital fabrication or fab lab movement [14, 15, 16, 17]. It is also closely connected with the DIY, the open-source hardware and open-source movement. A fab lab (fabrication laboratory) is a small-scale workshop with the ability to offer digital fabrication or interested individuals. A fab lab is equipped with computer-controlled tools, mainly 3D scanners, 3D printers and accessories.

The maker movement is present in various associations in Serbia, such as "Maker" association located in Novi Sad and active since 2016 and as a group of pupils and teachers officially or unofficially organized around elementary, high schools and universities. One of the major "making" events in Serbia is Maker Fest.

The Maker Fest is organized by Maker association for two years in the row (2017 and 2018). At Maker Fest 2018, there were over 30 exhibitors. Those exhibitors are primary, high school and university teams, associations and companies. This event has international character because exhibitors come from Serbia, Croatia, Slovenia and Romania (2017). The Maker Fest 2018 attended over 500 registered visitors. [33]

III. OPEN-SOURCE HARDWARE AND SINGLE-BOARD COMPUTERS

Open Source Hardware (OSHW) Statement of Principles 1.0 states that "open source hardware is hardware whose design is made publicly available so that anyone can study, modify, distribute, make, and sell the design or hardware based on that design. The hardware's source, the design from which it is made, is available in the preferred format for making modifications to it" (http://freedomdefined. org/OSHW). In order to maximize the ability of individuals to make and use hardware, the open source hardware should include usage of readily-available components and materials, standard processes, open infrastructure, unrestricted content, and open-source design tools.

There is a variety of open-source hardware platforms suitable for use in education [18, 19, 20]. In this section, only the most important ones are enlisted. So, one of the most popular open-source hardware platform is Arduino series [21, 22, 23]. It covers variety of development boards such as: Arduino UNO, MEGA, DUE, 101, Leonardo, Nano, etc. and number of low-cost clones and variations (such as ESP8266 based Wemos D1). There are other platforms, such as Texas Instruments Launchpad (MSP430G2552, MSP432, and CC3200 etc.), NodeMCU, and Photon Particle etc.

The strong foundation for the maker's projects also can be found in a series of single-board computers (SBC). The most popular SBC platform is Raspberry Pi 2, 3 etc. and its clones like (Orange Pi, Banana Pi). The other popular platforms are Texas Instruments Sitara based

BeagleBone (Black, Green, Blue), Arduino Yun, Intel Galileo and Intel Edison.

IV. OPEN-SOURCE HARDWARE PLATFORMS

In this section the learning platforms that are used in schools in Serbia are presented. These platforms are donated to the schools or school teams or given as awards for participations in researches or competitions.

A. Makeblock MBot

The widespread platform in Serbian schools is MBot made by Makeblock company located in Shenzhen, China [24]. This company develops Arduino based and robotics hardware and Scratch based software (the Scratch will be briefly explained in next section). This company makes efforts to prove educational tools for learning programming, engineering, and mathematics through the use of robotics. Together with MBot (the robotic set) Makeblock produces the set of sensors and accessories that are used to connect with MBot via proprietary designed RJ25 interface. Company sells its products in more than 140 countries.

Currently, according to company data there are over 4,500,000 users of their systems worldwide. In Serbia, according to official statistics, with donations more than 2,000 MBot units are delivered to more than 400 schools, making 90,000 pupils to have access to this platform (http://bitkazaznanje.rs).

B. BBC micro:bit

The Micro Bit (also BBC Micro Bit or micro:bit) is an ARM-based embedded system designed by the BBC for use in computer education in the UK. The board has following characteristics: dimensions 4×5cm, ARM Cortex-M0 processor, accelerometer, magnetometer, Bluetooth communication module, USB connectivity, 25 LEDs display, two programmable buttons, powered by USB or battery pack, etc. [25]

C. LittleBits

LittleBits is New York City based start-up company that made set of modular electronics designed for prototyping and learning. The company's goal is to democratize hardware and their mission is to "put the power of electronics in the hands of everyone, and to break down complex technologies so that anyone can build, prototype, and invent". LittleBits units are available in more

than 70 countries and used in more than 2,000 schools. [26-27]

Ther are several available kits for education: Code Kit, Droid Inventor Kit, Gizmos & Gadgets Kit, 2nd ed., Premium Kit, Rule Your Room Kit, Smart Home Kit, STEAM Student Set and Synth Kit.

D. STEMI Hexapod

STEMI Hexapod started as a student project (from Faculty of Electrical Engineering and Computer Science FER / University of Zagreb, Croatia) that resulted as a start-up company. In 2015 company raised over $36,000 in crowd funding campaign, with 280 backers from more than 30 countries around the world. Now, company is selling the products all over the world. Their Hexapod is based on Arduino DUE microcontroller board and WiFi and Bluetooth ESP8266 / ESP32 communication modules. [28]

V. OPEN-SOURCE SOFTWARE LEARNING PLATFORMS

As in the case of open-source hardware, there is a number of open source software development platforms designed for use with presented hardware platforms. The majority of platforms are based on Scratch [29], the platform that is designed for learning programming in elementary, middle, and high schools. It is developed like a project of the Lifelong Kindergarten Group at the MIT Media Lab and it is free of charge. For software development for MBot devices the mBlock is used. It is the block-based programming software compatible with Arduino and based on Scratch 2.0 and Scratch 3.0. The similar blocks-based tool is used for programming Android applications. This is MIT App Inventor [30], an intuitive, visual programming environment that allows everyone, even children, to build fully functional apps for smartphones and tablets. The MIT App Inventor project seeks to democratize software development by empowering all people, especially young to move from technology consumption to technology creation.

Arduino IDE [31] is the open-source development environment that makes writing code and uploading it to the Arduino development board very easy. It runs on Windows, Mac OS X, and Linux. The environment is written in Java and based on Processing (https://processing.org) and other open-source software. This software can be used with any Arduino board or NodeMCU and

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number of Arduino clones. Texas Instruments Energia is similar open source IDE designed to work with Texas Instruments Launchpad boards. [32]

VI. CONCLUSION

As a conclusion it may be pointed out that in Serbia there is already good foundation for possible implementation of "making" and digital fabrication in educational process. In Serbia we have: various associations with extensive activities, frequent meet-ups, school groups based on individual teacher's and pupil's enthusiasm, occasional equipment donations, the will and the energy, volunteer work (with no reward and benefits) and contacts in the region and Europe.

In order to successfully achieve this goal we need: understanding, strategy, support for school and off-school activities, partial implementation in elementary and high school curricula, seminars, workshops and courses for educators, pupils, students and promoters.

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SCIENTIFIC

PAPERS

Classification with ID3 and SMO using Weka

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Abstract – In this paper, we look at ID3 and SMO (SVM) classification algorithms. We used the wine quality dataset that is publicly available. In our research, we classify red wine instances. Data refer to "Vinho Verde", a product that is produced in Minho, a district in northwestern Portugal. According to the obtained results, SMO has more correctly classified instances than ID3, but ID3 has fewer incorrectly classified instances.

I. INTRODUCTION

The number of data is constantly increasing. Data mining refers to extracting or mining the knowledge from large amount of data. The term data mining is appropriately named as 'Knowledge mining from data' or "Knowledge mining" [1]. Knowledge Discovery in Databases is the non-trivial process of identifying valid, novel, potentially useful, and ultimately understandable patterns in data [2]. Figure 1 shows the process for discovering knowledge from databases. First step is to select the data to be used. From databases we can select the tables with records that we will use to extract knowledge. Often tables contain data that does not match our research goals. It is therefore necessary to initially preprocess the data. The transformation phase follows. At this stage, the data is transformed into a form that is suitable for research. The next process is the discovery of patterns from the transformed data. Basically this is the data mining phase. The last step of this process is the evaluation of the knowledge gained from data.

As we have previously stated, the basic purpose of data analysts is to extract data schemes. Usually the data are stored electronically, and the search is done with the help of a computer. Patterns in data can be automatically identified, validated and used for future predictions. Analysts are trying to increase opportunities for finding patterns in the data. If this process is automated, it will ease the work and in the future we can more easily and more efficiently extract knowledge from the data. According to some analyzes, the amount of data stored in databases doubles every 20 months [2]. This is a big step in increasing the data. Although the number of data increases, with the discovery of new search engines, the opportunities for gaining knowledge from data are increasing. If the data are analyzed intelligently, valuable resources can be
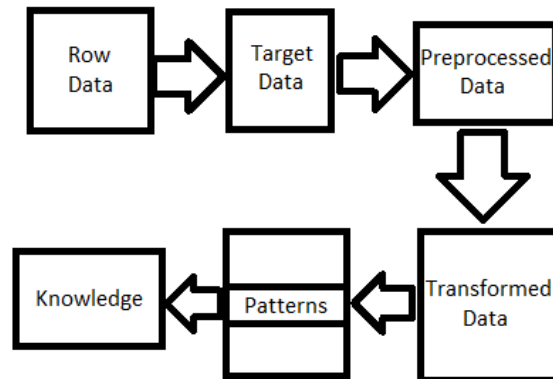
Figure 1. Process for discovering knowledge in databases

obtained, which can later be used for some future plans.

Data mining is about solving problems by analyzing data that are already present in databases [3]. Discovering patterns in data is one of the characteristics of data mining.

II. CLASSIFICATION

Classification is one of the Data Mining techniques that is mainly used to analyze a given dataset, takes each instance of it and assigns this instance to a particular class [4]. This process aims to make the classification error very small. The classification allows the extraction of models that define the classes for a given data set.

There are three different learning approaches that are used for data mining: supervised learning and unsupervised learning [5]. The algorithms for supervised learning use set of examples that have known labels. If the labels are nominal value, then it is a classification task. If the labels are numerical values, then it is regression task. Basically, the classification and regression are two types of supervised learning. When we have a classification problem, then the output variable is a category such as "green", "blue", "disease", "no disease". In regression, as output we have real values. Examples are "dollars", "weight" and so on. This type of learning uses input variables (x)

and output variables (y). An algorithm is used to learn the mapping function from the input to the output.

$$y=f(x) \qquad (1)$$

The idea is that if we have new input data (x) in the future, we can predict the outputs from this data (y). This learning algorithm looks a lot like the supervision of learning by the teacher. That is why this is called supervised learning. The correct answers are familiar to us. The algorithm uses training data to make predictions. This process is iterative. The algorithm is corrected by the teacher. When it reaches an acceptable level of performance, it stops. Supervised learning is the most used practical machine learning.

The labels of the examples in the data sets in unsupervised learning are unknown. This algorithm uses the similarity of attribute values to group the examples. If there are only input values (x) and no corresponding output variables, then it is unsupervised learning. This type of learning, tend to model the distribution in the data in order to learn more about data. Unlike supervised learning, there is no correct answers and there is no teacher. Algorithms use own sources to discover and to present the interesting structure in the data. Examples of unsupervised learning are: clustering and association. Clustering algorithms are used to discover the inherent groupings in the data. An example of this is grouping customers by purchasing behavior. Association tend to discover the rules that describe large portions of data. An example of association is: "People that buy fish also tend to buy salt". Some of the more familiar algorithms for unsupervised learning are: "k-means" for clustering problems and "Apriori" for association rule learning problems [6]. Semi-supervised learning has a small subset of labelled examples. It also has a lot of unlabeled examples. These problems are found between supervised learning and unsupervised learning. An example for this is when we have a folder with documents that are labeled and the majority are unlabeled. Here, unsupervised learning is used to discover and to learn the structure in the input variables. Supervised learning is used to make best predictions for the unlabeled data.

In this paper, we will look at the classification as well as the algorithms for classification. As we have said before, classification uses given input to predict a certain outcome. The algorithm processes

TABLE I.   TRAINING AND PREDICTION SET

Fixedacidity	7.4	11.2	7.3	7.6
Volatileacidity	0.7	0.28	0.65	0.3
Citricacid	0	0.56	0	0
Residualsugar	1.9	1.9	1.2	1.4
Chlorides	0.076	0.075	0.065	0.07
Freesulfurdioxide	11	17	15	10
Totalsulfurdioxide	34	60	21	34
Density	0.9978	0.998	0.9946	0.88
pH	3.51	3.16	3.39	3.2
Sulphates	0.56	0.58	0.47	0.5
Alcohol	9.4	9.8	10	9.7
Quality	5	6	7	?

a training set in order to predict the outcome. The training set contains a set of attributes and the respective outcome, usually called goal or prediction attribute [7]. The relationship between the attributes is used to predict the outcome. Next, this algorithm uses prediction set. It contains the same set of attributes except the prediction attribute (it is not yet known). The algorithm produces predictions based on the analysis of the input. Using the accuracy of the algorithm we know if it is good or not.

In the Table 1, we can see the training set and prediction set, which contains data about wine quality. Here the prediction attribute (quality) indicates the quality of wine. The prediction set is given in the last column of the table. The goal is to use the data from the training set, to determine the wine quality of the example from prediction set.

Classification often uses prediction rules to

Figure 2.   Rules for the wine quality dataset

express knowledge [7]. Prediction rules consist of IF-THEN statements. IF expression consists of conjunction of conditions. After IF part follows THEN which contains the prediction. Some of the rules for the wine quality dataset that are obtained using the PART algorithm in Weka are given in Figure 2. There are 204 rules in total.

Often the prediction rules are very large. How well predictions are done, is measured in percentage of predictions hit against the total number of predictions.

There are several classification algorithms: Decision Trees, K-Nearest Neighbor, Support Vector Machines, Naïve Bayesian Classification, Neural Networks. In this paper, we considered the decision trees and Support Vector Machines.

III. DECISION TREES

The decision tree is one of the most commonly used classification algorithms. Decision tree is hierarchical tree structure that is used to classify classes based on series of questions (or rules) about the attributes of the class [8]. The attributes can be nominal, ordinal, binary and quantitative values. The classes must be qualitative types. The decision tree produces sequence of rules based on data of attributes and its classes. Basically the sequence of rules are series of questions. These questions are used to recognize the class. We ask questions and we answer until we make a conclusion about the class to which the record belongs. These questions can be presented as form of decision tree. It is hierarchical structure which consist of nodes and directed edges. There are three types of nodes: root node, internal nodes and leaf or terminal nodes. Root node is the top node in the three. It has no incoming edges and zero or more outgoing edges. Internal nodes have exactly one incoming edge and two or more outgoing edges. Terminal nodes have one incoming edge and no outgoing edges. In decision trees, each terminal node is a class (class label). Internal nodes represent attribute test conditions, to separate instances with different characteristics. Once the decision tree is constructed, it is easy to classify a test record. First, we start from the root node and we apply the test condition to the record (We ask the questions). Based on the outcome of the test, we follow the appropriate branch. After that, we have another internal node (another test condition) or terminal (leaf) node. If the last step is terminal node, then the class label is assigned to

the record. In our paper, for decision three, we look at the ID3 algorithm.

A. ID3 algorithm

ID3 is a simple decision tree learning algorithm developed by Ross Quinlan (1983) [9]. This algorithm uses the greedy search technique on a given dataset, to test each attribute at every tree node. ID3 uses a metric known as information gain to select the attribute that is most useful for classifying a given dataset. We used this metric to minimize the depth of the tree (minimize asked questions). It is a function that measure which questions provide the most balanced splitting [9]. The information gain measures how well a given attribute separates training examples into class labels [10]. We selected the attribute with highest information gain (most useful information for classification). In order to define the gain, we firstly introduce the notion of entropy from information theory. The entropy measures the amount of information in an attribute. On a given set S, which contains positive and negative instances, the entropy is [10]:

$$\text{Entropy}(S) = \sum -p(I) \log 2\ p(I) \qquad (2)$$

or

$$\text{Entropy}(S) = -P(\text{positive}) \log 2 P(\text{positive}) -$$
$$P(\text{negative}) \log 2 P(\text{negative})$$

For example, if S is a collection of 15 examples with 10 YES and 5 NO examples then [10]:

$$\text{Entropy}(S) = -(10/15)\ \text{Log2}\ (10/15) - (5/15)\ \text{Log2}$$
$$(5/15)$$

If all members of S belong to the same class, then the entropy is 0. It is a case when we have perfectly classified instances. If the entropy is 1, then the classification is totally random.

The information gain is expected reduction of entropy related to specific attribute when we split a decision tree node [9]. The information gain Gain(S,A) of example set S, on attribute A is [10]:

$$\text{Gain}(S,\ A) = \text{Entropy}(S) - \sum ((|Sv| / |S|) * \text{Entropy}(Sv))$$
$$(3)$$

We calculate the information gain for each attribute and we use the highest gain as the decision node. The attribute that has a highest gain will be root node. We use the gain to branch the decision tree.

To evaluate the precision and recall of the classifiers we must compute several measures. Precision of the classifier can be interpreted as

probability of a instance classified in the current class actually to belong to that class and is defined as:

$$P = \frac{TP}{TP + FP} \tag{4}$$

where FP (False Positive) is the number of instances incorrectly labeled as belonging to the current class and TP (True Positive) is the number of correctly labeled instances that belong to the current class. The sensitivity or recall of the classifier denotes the probability that a instance of a current class is correctly classified. This measure is computed according to the formula:

$$R = \frac{TP}{TP + FN} \tag{5}$$

FN (False Negative) is the number of instances that belong to the current class incorrectly labeled as belonging to other classes, and TP has the same meaning as defined in (4).

If we combine previous two metrics, we can estimate the efficiency of the classifier. For that purpose, measure F1 is computed as harmonic mean of precision and recall. F1 is calculated according to the following formula:

$$F1 = \frac{2RP}{R + P} = \frac{2 \times TP}{2 \times TP + FP + FN} \tag{6}$$

IV. SUPPORT VECTOR MACHINES

Support Vector Machines (SVM) is a classifier defined by a separating hyperplane [11]. SVM represents the separating hyperplane (decision boundary) using a subset of the training examples. This technique has been applied to a number of practical application and it has roots in statistical learning theory. Using training data, this algorithm can in the future determine a hyperplane that classifies new instances. This hyperplane in a two dimensional space is a line that divide the plane in two parts (two classes). We can use SVM for classification also with high-dimensional data (solving the problem with dimensionality). In Figure 2 we can see a classification problem consisting of two classes. One of the classes is set of circles and another is set of squares. These two classes are separated by line. All objects on the left side of the line belong to the class squares. All objects on the right side of the red line belong to the class circles. This separation of classes is a
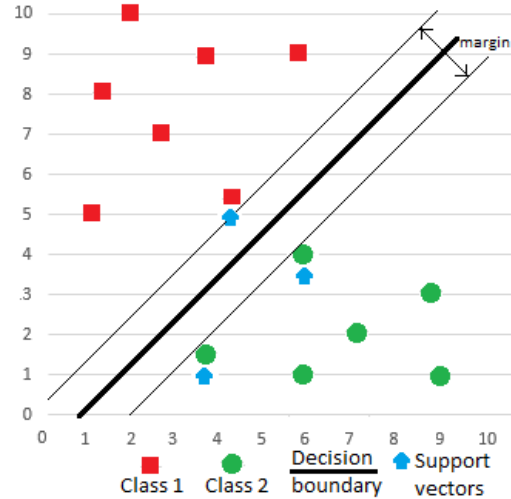
Figure 3. SVM. Separation of classes

SVM feature. SVM finds a line (hyperplane) that separate the classes. The goal of SVM is to find the best classification function to separate the training examples into two classes [5]. This classification function can be determined geometrically. This function corresponds to a line in two dimensional space and it passes through the middle of the two classes (black line of Figure 2). Using this function in the future, new data instances can be classified. If we look at the example in Figure 3, we can see that other lines can also be drawn that also separate objects into two classes. SVM classification function maximize the margin between the two classes. The margin is a space between the two classes that is separated by a line. This is a concept of maximum margin hyperplanes. SVM enables the creation of classifiers that maximize the margin of hyperplanes to minimize the worst-case generalization errors. An example of such a classifier is the linear SVM. It searches for a hyperplane with the largest margin. This classifier is also known as maximal margin classifier. The decision boundary of a linear classifier can be presented as:

$$w*x+b=0, \tag{7}$$

Here, w and b are parameters of the linear decision boundary model.

Margin maximization is equivalent to the minimization of the following objective function:

$$f(w) - \frac{\|w\|^2}{2} \tag{8}$$

The learning task in SVM (Linear separable case) can be formalized as:

$$\min_w \frac{\|w\|^2}{2}$$

subject to $y_i(w*x_i+b) \geq 1$, i=1,2,…,N   (9)

The objective function is quadratic and the constraints are linear. This is a convex optimization problem. It can be solved using The Lagrange multiplier method. The objective function for this optimization problem (Lagrangian function) is:

$$L_p = \frac{1}{2}\|w\|^2 - \sum_{i=1}^{N} \lambda_i(y_i(w \cdot x_i + b) - 1)$$ (10)

Here, the parameters λ_i are called Lagrange multipliers.

We used SMO in our research as a SVM classifier.

A.   SMO

SMO (Sequential Minimal Optimization) is an optimization algorithm used to train an SVM on a data set [12]. It was invented by John Platt in 1998 at Microsoft Research. SMO solves the SVM QP (quadratic programming) problems by decomposing it into QP sub-problems and solving the smallest possible optimization problem, involving two Lagrange multipliers, at each step [13]. These small QP problems are solved analytically, which avoids using a time-consuming numerical QP optimization as an inner loop [14]. SMO can handle a very large training set. This is allowed because the amount of memory required for SMO is linear in the training set size. Sequential Minimal Optimization (SMO) is a simple algorithm that can quickly solve the SVM QP problem without any extra matrix storage and without using numerical QP optimization steps at all [14]. SMO can fit very large SVM problems in the memory of personal computer or workstation. This algorithm is less susceptible to numerical precision problems because no matrix algorithms are used in SMO [14]. SMO has two components. It uses analytic method for solving the two Lagrange Multipliers. SMO also uses a heuristic for choosing which multipliers to optimize [14].

V.   USED TECHNOLOGY AND DATASET

We used the Weka (Waikato Environment for Knowledge Analysis) tool in our research [15].
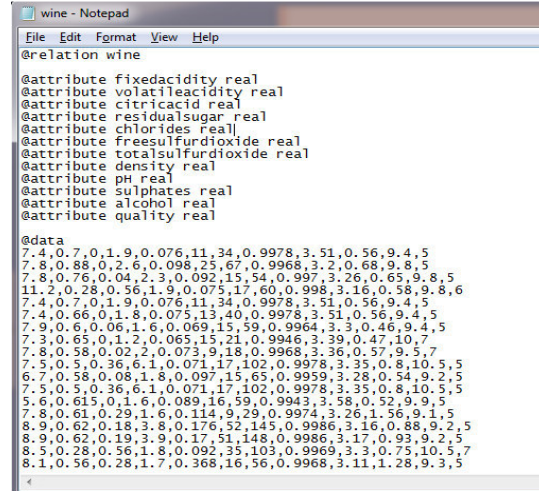
Figure 4.   ARFF for wine quality dataset

We used the latest version 3.8.2. Weka contains implementation of machine learning algorithms for data mining tasks and a lot of data mining tools such as tools for preprocessing, classification, regression, clustering, association rules, and visualization. Weka is a software that is written in Java. It is open source software issued under the GNU General Public License. It also has a Graphical User Interface (GUI). This greatly helps in working with projects related to machine learning. For scripting large jobs, can be used Command Line Interface, which is part of Weka. We can integrate our applications with Weka using the Java API. Weka GUI has five parts: Explorer, Experimenter, Knowledge Flow, Workbench and Simple CLI.

TABLE II.   DIFFERENCES BETWEEN THE CLASSIFICATION ALGORITHMS

Properties	ID3	SMO (SVM)
Total number of instances	1599	1599
Correctly Classified Instances	896	972
Correctly Classified Instances in percent	56.053%	60.788%
Incorrectly Classified Instances	483	627
Incorrectly Classified Instances in percent	39.212%	30.2064
Kappa statistic	0.4508	0.3583
Mean absolute error	0.1179	0.2346
Root mean squared error	0.3401	0.3294
Unclassified Instances	220	0

TABLE III.   DETAILED ACCURACY BY CLASS FOR
ID3 AND SMO

Detailed Accuracy By Class for ID3			
Precision	Recall	F-Measure	Class
0.000	0.000	0.000	3
0.102	0.125	0.112	4
0.724	0.722	0.723	5
0.666	0.655	0.661	6
0.556	0.556	0.556	7
0.167	0.182	0.174	8
Detailed Accuracy By Class for SMO			
Precision	Recall	F-Meassure	Class
0.000	0.000	0.000	3
0.250	0.019	0.035	4
0.657	0.764	0.706	5
0.571	0.603	0.587	6
0.532	0.332	0.409	7
0.000	0.000	0.000	8

For the purposes of our research, we used the wine quality dataset that is publicly available [16]. Specifically, in our research we classified red wine instances. Data refer to "Vinho Verde", a product that is produced in Minho, a district in northwestern Portugal. The dataset for red wine has 1599 instances. All instances have 12 attributes, of which 11 are physical-chemical properties of the wine, while the last feature is the wine quality. The wine quality can be in the range of 1-10 (1-very poor quality, 10-very good quality). In our research this feature is a class attribute. The other features are given in Figure 4.

Weka as a machine learning tool supports ".csv" and its natural ".arff" (Attribute-relation file format) types of input. An ARFF (Attribute-Relation File Format) file is an ASCII text file that describes a list of instances sharing a set of attributes [17]. In this research .ARFF was used as input. The structure of this file can be seen in Figure 4.

VI.   OBTAINED RESULTS IN WEKA

For the purposes of this research, we used two classification algorithms: ID3 and SMO (SVM). As test option we used cross-validation with 10 folds. With the application of ID3, the total number of correctly classified instances is about 56%. The time it took to build the model is 0.03 seconds. Detailed accuracy results are given by Confusion Matrix:

```
=== Confusion Matrix ===

  a   b   c   d   e   f   <-- classified as
  0   2   3   1   0   0 |   a = 3
  4   5  20  11   0   0 |   b = 4
  3  30 433 118  16   0 |   c = 5
  0  12 118 361  55   5 |   d = 6
  0   0  24  47  95   5 |   e = 7
  0   0   0   4   5   2 |   f = 8
```

With the application of SMO (SVM), the total number of correctly classified instances is about 60%. The time it took to build the model is 2.78 seconds. Detailed accuracy results are given by Confusion Matrix:

```
=== Confusion Matrix ===

  a   b   c   d   e   f   <-- classified as
  0   1   7   2   0   0 |   a = 3
  1   1  31  19   1   0 |   b = 4
  0   1 520 147  11   2 |   c = 5
  0   1 213 385  39   0 |   d = 6
  0   0  20 111  66   2 |   e = 7
  0   0   1  10   7   0 |   f = 8
```

Using the Attribute Selection algorithm, we have obtained results by which the attribute "alcohol" has the greatest information gain. From Table 2 we can see the differences between ID3 and SMO algorithm. From Table 3 we can see the detailed accuracy by class.

VII.   CONCLUSION

According to the obtained results SMO has more correctly classified instances than ID3, but ID3 has fewer incorrectly classified instances. The time of model building with SMO is greater than ID3. Using this training set, the quality of wine for new instances can be predicted in the future.

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The Impact of Management on the Development of Education

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Abstract - In this paper the authors analyze the impact and significance of management in improving the development of education. Change in the world is constant so science and education is a key factor in managing change. New knowledge represents new horizons and seeks complete new engagement in the implementation of change. Changes from managers require greater activities within the educational process, that is, in all spheres of life that can make the education system more efficient and effective for better work of the institution. Education represents the "central nervous system" of every society educational, cultural chain that constantly vibrates. In such a chain leading role, in addition to educators, teachers, professors, and others should be knowledgeable, capable and skilled managers. Managers are required to have the ability to innovate and manage the segment of planning, organizing, coordinating and controlling the execution of activities of educational institutions.

I. INTRODUCTION

Globally, the world is in a state of change, and science and education are a key factor in these changes. New knowledge reveals new horizons and demand, new aging in the implementation of change [5]. Changes in educational institutions require activities within the educational process, that is, in everything that the national education system can improve in a more efficient and effective way of doing business. The basic foundation of each state is the education of young people. Until the implementation of successful socio-economic development comes with knowledge, and the knowledge comes from the education of young people. This creates a number of questions that seek answers in the educational development process that receives the attributes of one of the supporting factors of the country's development. Therefore, changes require activities within the educational process, that is, everything that the education system can make more efficient and effective in the context of socio-economic development of Serbia [5].

It is very important for the organizations to understand that learning never stops and that it must become a norm in order to survive in a growing competition. An important aspect of a community geared towards knowledge is to think about all the common progress and better results. First of all, this is achieved by successful teamwork, so knowledge and learning are a key part of success. The main challenge nowadays is the ability of the organization, as well as the entire community to gather a larger amount of explicit knowledge [9]. Successful development requires adequate knowledge, inventiveness, responsibility, initiative and innovation, and a lot of work. Also, new market realities require elasticity and speed [5]. The digital age gave people new ways of communication and interaction [1].

II. THE IMPACT OF MANAGEMENT ON MODERN EDUCATION

Education in Serbia has to go through the changes that have already taken place in developed countries, because we live in a knowledge society and knowledge economy. The potential of a country in many respects depends on the human resources that the community has [9]. The management in the educated institutions aims to represent the process of planning, organizing, managing and controlling financial, fiscal, human and information resources in education, in order to achieve its goals, in an efficient and effective way of doing business. The role and importance of management in educational institutions is aimed at achieving a better quality of knowledge development, represents the development of one country's education system, active support to the knowledge improvement program, observing the development of knowledge infrastructure and facilitating the creation of connections, coordination and communication.

New understanding of the role of managers in educational institutions aims to enable better flow of knowledge, developing the educational system of a country, active support program knowledge, monitoring of development of knowledge

infrastructure and enabling the creation of bonds, coordination and communication [9].

For the success of management in education it is necessary [4]:

- That objectives and decision-making priorities are precisely define,
- The relevance of management,
- The importance of school director (institution) as the supreme manager,
- Adequate division of roles and responsibilities,
- Expressed ability to solve problems by managers,
- Proactive performance of managers,
- Planning and communication,
- Job commitment,
- Control of the implementation of the measures taken,
- Flexibility.

The main features of modern management in educational institutions are [4]:

- Management in education represents a process, or a series of, continuous and related activities,
- It is primarily oriented towards the realization of the goals of the organization,
- In most cases, it is realized through work with people and through the resources of the organization itself.

Management in education includes, in most cases, the following processes: planning, organization, guiding and control [6]. Unpredictable characteristics of the organization create difficulties for leaders and presuppose a different approach to management in schools and colleges [2]. For leaders in education, it is necessary to demonstrate an understanding of the moral complexity and the ability to create clear links between values and actions undertaken in educational institutions. The leader in education is trying to establish conditions for dialogue, participation and respect for people and their ideas [3].

The basic function of each management, including management in education, is the introduction of innovations so that the organization becomes more successful in its work [8]. By the term management in education, it can also be implied a set of staff that perform activities of managing educational institutions and organizations (primary and high schools, higher education institutions, various institutions in the field of formal and non-formal education) [9].

The ideal manager in education, among other things, should be [9]:

- Integrator of personnel potentials and work processes,
- The entrepreneur and producer of successful educational results,
- A systematic initiator of ideas, actions and changes,
- A creative visionary and planner,
- Communication coordinator,
- Constructive technology organization and innovation,
- Participant animator,
- Strategies through continuous education, etc.

Education policy is an important part of the overall development policy of a society, in wich business entities should be key drivers of innovation, competitiveness and improvement of modern education system [9]. The development of science and technology affect the growth of the volume of scientific and social information that is directly relevant to individuals [10]. The need to invest in the development of education, or the creation and improvement of appropriate human resources, in response to certain market economy needs, has the character of the investment and becoming a prerequisite without which people cannot achieve sustainable economic development of society and its progress

III.   CONCLUSIONS

The role of management in educated institutions, in countries in transition, does not have adequate attention, bringing these countries in a different position with developed countries within the European Union, with educated and qualified managers. Education and training, and then the employment of professional managers in educational institutions, aims to increase productivity, efficiency and harmonize all levels of management and decision making, as well as successfully implementing the teaching process in educational institutions. The role of the modern concept of education should have directed straight towards the acquisition of practical knowledge and skills requirements, accepted in all spheres of life. The need for educational institutions for the engagement of educated and professional managers raises the level of organization and improves the performance of the institution, which includes the satisfaction of all stakeholders and

users of the services of the education process of young people.

The future of Serbian education and science primarily depends on those who work in education and who sincerely want to preserve and improve it according to the national and state interests of development [5]. The future is what is now in development. Working with young people is still at the beginning of what is yet to be [7].

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Application of Runge - Kutta and Euler methods for ODE through examples

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Abstract - Differential equations are essential for a mathematical description of nature. A differential equation is an equation, where the unknown is a function and both the function and its derivatives may appear in the equation. We will concern on second order differential equation and on the system of two differential equations from first order. Second order differential equation is an equation involving the unknown function y, its derivatives y' and y'', and the variable x. We can solve differential equation with numerical methods such as Runge - Kutta and Euler. From literature it's known that the Euler method is less accurate than the Runge-Kutta method. In this paper we examine two examples for differential equation and we will use Runge - Kutta and Euler methods to solve them. The examples are solved with mathematical software Mathematica by graphic representations and obtaining approximate values in tables, for better visualization for students who process these methods.

I.   INTRODUCTION

Most of the differential equations cannot be solved easy, so then people tried something different. Instead of solving the equations they tried to show whether an equation has solutions or not, and what properties such solution may have. [1]

Differential equations are essential for a mathematical description of nature. A differential equation is an equation, where the unknown is a function and both the function and its derivatives may appear in the equation. Newton's second law of motion, $ma = f$ is maybe one of the first differential equations written. This is a second order equation, since the acceleration is the second time derivative of the particle position function. Second order differential equations are more difficult to solve than first order equations. [1]

We will concern on second order differential equation. Second order differential equation is an equation involving the unknown function y, its derivatives y' and y'', and the variable x. Or, we can define a second order linear differential equation for the function y with equation

$$y'' + a_1(t)y' + a_0(t)y = b(t) \qquad (1)$$

where a_1, a_0, b are given functions on the interval I $\subset$R. The equation (1)

(a) is homogeneous if the $b(t) = 0$ for all t $\in$R;

(b) has constant coefficients if a_1 and a_0 are constants;

(c) has variable coefficients if either a_1 or a_0 is not constant [1], [2], [3].

We can solve differential equation with numerical methods such as Runge - Kutta (RK) and Euler. We can use the numerical methods Euler and RK only if the ODE from the second order is transformed to the system of two ODE from the first order:

$$\begin{cases} \dfrac{dy_1}{dx} = f(x, y_1(x), y_2(x)) \\ \dfrac{dy_2}{dx} = g(x, y_1(x), y_2(x)) \end{cases}$$

with initial values $y_1(x_0) = \alpha, y_2(x_0) = \beta$.

The Runge-Kutta methods are an important family of iterative methods for the approximation of solutions of ODE's. This method were developed around 1900 by the German mathematicians C. Runge (1856–1927) and M.W. Kutta (1867–1944) [4]. The formula for the fourth order Runge-Kutta method (RK4) is given below [5], [7]. Then the following formulas are

$$k_1 = h f(x_n, y_{1,n}, y_{2,n})$$

$$d_1 = h g(x_n, y_{1,n}, y_{2,n})$$

$$k_2 = h f(x_n + \frac{h}{2}, y_{1,n} + \frac{k_1}{2}, y_{2,n} + \frac{d_1}{2})$$

$$d_2 = h g(x_n + \frac{h}{2}, y_{1,n} + \frac{k_1}{2}, y_{2,n} + \frac{d_1}{2})$$

$$k_3 = h f(x_n + \frac{h}{2}, y_{1,n} + \frac{k_2}{2}, y_{2,n} + \frac{d_2}{2})$$

$$d_3 = h g(x_n + \frac{h}{2}, y_{1,n} + \frac{k_2}{2}, y_{2,n} + \frac{d_2}{2})$$

$$k_4 = h f(x_n + h, y_{1,n} + k_3, y_{2,n} + d_3)$$

$$d_4 = h g(x_n + h, y_{1,n} + k_3, y_{2,n} + d_3)$$

$$x_{n+1} = x_n + h$$

$$y_{1,n+1} = y_{1,n} + \frac{1}{6}(k_1 + 2k_2 + 2k_3 + k_4)$$

$$y_{2,n+1} = y_{2,n} + \frac{1}{6}(d_1 + 2d_2 + 2d_3 + d_4)$$

where h is define to be the time step size on the given interval $[a, b]$ and $x_n = x_0 + n h$.

If we want to approximate the solution to the initial-value problem

$$\frac{dy}{dx} = f(x, y), y(x_0) = y_0 \tag{2}$$

at $x = x_1 = x_0 + h$, where h is small. The idea behind Euler's method is to use the tangent line to the solution curve through (x_0, y_0) to obtain such an approximation. The equation of the tangent line through (x_0, y_0) is $y(x) = y_0 + m(x - x_0)$, where m is the slope of the curve at (x_0, y_0). From equation (2), $m = f(x_0, y_0)$ so $y(x) = y_0 + f(x_0, y_0)(x - x_0)$ [6], [7].

Then the following formula is

$$x_{n+1} = x_n + h$$
$$y_{1,n+1} = y_{1,n} + h f(x, y_{1,n}(x), y_{2,n}(x))$$
$$y_{2,n+1} = y_{2,n} + h g(x, y_{1,n}(x), y_{2,n}(x))$$

where h is define to be the time step size on the given interval $[a, b]$ and $x_n = x_0 + n h$.

From literature it's known that the Euler method is less accurate than the Runge-Kutta method. The examples are solved with mathematical software Mathematica by graphic representations and obtaining approximate values in tables, for better visualization for students who process these methods.

II. APPLICATION OF RUNGE - KUTTA AND EULER METHODS ON REAL EXAMPLES

We will consider two examples for second order differential equation and we will use Runge - Kutta and Euler methods to solve them.

Both examples are unsolved task from the book [8].

Example 1: First task is as follow

$$y''(x) = xy'(x) - 3y(x) \tag{1}$$

with initial values $y(0) = 0, y'(0) = -3$ and with solution $y = x^3 - 3x$.
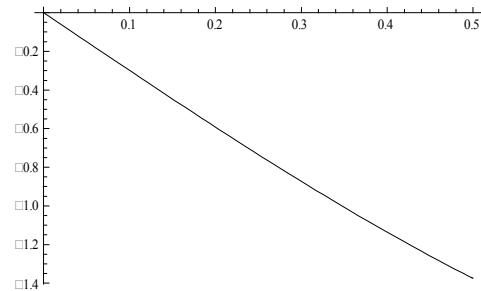
Figure 1. Geometric presentation of the solution $y = x^3 - 3x$ for ODE (1)

In Figure 1 is shown the graph of the solution $y = x^3 - 3x$ for ODE (1) and for the exact values in the interval $[0, 0.5]$ by step h=0.05, we obtained Table 1:

```
0.
-0.149875
-0.299
-0.446625
-0.592
-0.734375
-0.873
-1.00713
-1.136
-1.25888
-1.375
```

Table 1: Exact values of the solution $y = x^3 - 3x$ for ODE (1)

We can use the numerical methods Euler and RK only if the second order ODE is transformed to the system of two first order ODE:

$$\begin{cases} (y_1)'(x) = y_2(x) \\ (y_2)'(x) = x y_2(x) - 3 y_1(x) \end{cases} \tag{2}$$

with initial values $y_1(0)=0, y_2(0)=-3$.

This system solved with Euler's method with h=0.05 is presented in figure 2.

Figure 2: . Geometric presentation of the solution with Euler's method

Numerical values with Euler's method for the system (2) are obtained in Table 2:

xn	y1	y2
0.	0.	-3.
0.05	-0.15	-3.
0.1	-0.3	-2.985
0.15	-0.44925	-2.95493
0.2	-0.596996	-2.9097
0.25	-0.742481	-2.84925
0.3	-0.884944	-2.77349
0.35	-1.02362	-2.68235
0.4	-1.15774	-2.57575
0.45	-1.28652	-2.4536
0.5	-1.4092	-2.31583

Table 2: Numerical values via Euler's method for (2)

The solution of second order ODE (1) solved with Runge-Kuta's method with h=0.05 is presented in figure 3.

Figure 3: Geometric presentation of the solution with RK's method

Numerical values with RK's method for the system (2) are obtained in Table 3:

xn	y1	y2
0.	0.	-3.
0.05	-0.149875	-2.9925
0.1	-0.299	-2.97
0.15	-0.446625	-2.9325
0.2	-0.592	-2.88
0.25	-0.734375	-2.8125
0.3	-0.873	-2.73
0.35	-1.00712	-2.6325
0.4	-1.136	-2.52
0.45	-1.25887	-2.3925
0.5	-1.375	-2.25

Table 3: Numerical values via RK's method for (2)

The graphic presentations from figure1, figure 2 and figure 3 are presented on the same 2D system in figure 4:

Figure 4: Geometric presentations of the exact solution and the solution via Euler's and RK's method

From the figure 4, we notice that the geometric presentation obtained with RK's method is closer to the exact solution of ODE (1) than the geometric presentation obtained with Euler's method. The same result is obtained in the following table 4:

X_n	True values	Euler's method	absolute error for Euler's method	RK's method	absolute error for RK's method
0	0	0	0	0	0
0.05	-0.149875	-0.15	0.000125	-0.149875	0
0.1	-0.299	-0.3	0.001	-0.299	0
0.15	-0.446625	-0.44925	0.002625	-0.446625	0
0.2	-0.592	-0.596996	0.004996	-0.592	0
0.25	-0.734375	-0.742481	0.008106	-0.734375	0
0.3	-0.873	-0.884944	0.011944	-0.873	0
0.35	-1.00713	-1.02362	0.01649	-1.00712	0.00001
0.4	-1.136	-1.15774	0.02174	-1.136	0
0.45	-1.25888	-1.28652	0.02764	-1.25887	0.00001
0.5	-1.375	-1.4092	0.0342	-1.375	0

Table 4: Comparison of the absolute errors between Euler's method and RK's method for the ODE (1)

From the table 4, we can conclude that the absolute error made with the numerical Euler's method is smaller than 0.04, but the absolute error made with the numerical RK's method is smaller or equal than 0.00001 for the same considered interval.

From the graphical presentations and the considered tables can be concluded that the numerical RK's method is better for the numerical solving of the ODE than the numerical Euler's method.

Example 2: The second task is mathematical spiral given with the following system:

$$\begin{cases} (y_1)'(x) = -y_1(x) + y_2(x) \\ (y_2)'(x) = -y_1(x) - y_2(x) \end{cases} \quad (3)$$

with initial values $y_1(0) = 0, y_2(0) = 4$.

This task has the solution:

$$y_1(x) = 4e^{-x} \sin x, y_2(x) = 4e^{-x} \cos x.$$

In Figure 5 is shown the graph of the solution for the system (3):
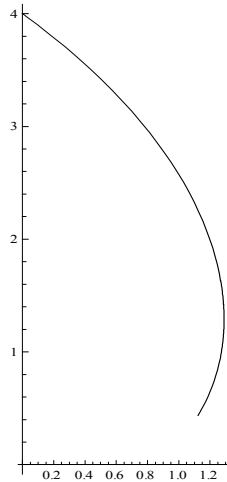
Figure 5: Geometric presentation of the solution of the mathematical spiral (3)

In Figure 6 is shown the graph of the solution of the mathematical spiral (3) and for the exact values for y_1, y_2 in the interval [0, 1.2] by step h=0.2, we obtained Table 5:

0.	4.
0.650627	3.20964
1.04414	2.46962
1.23953	1.81182
1.28932	1.2522
1.23824	0.795064
1.1229	0.43656

Table 5: Exact values of the solution of the mathematical spiral (3)

In figure 6 is presented the mathematical spiral solved with Euler's method by h=0.2.
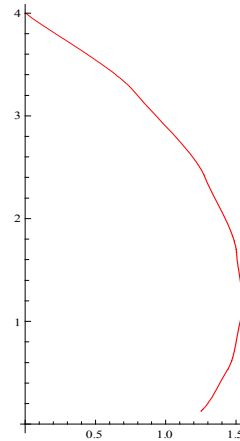
Figure 6: Geometric presentation of the solution with Euler's method

Numerical values with Euler's method for the system (3) are obtained in Table 6:

xn	y1	y2
0.	0.	4.
0.2	0.8	3.2
0.4	1.28	2.4
0.6	1.504	1.664
0.8	1.536	1.0304
1.	1.43488	0.51712
1.2	1.25133	0.12672

Table 6: Numerical values via Euler's method for (2)

The solution of the mathematical spiral (3) solved with Runge-Kuta's method with h=0.2 is presented in figure 7.
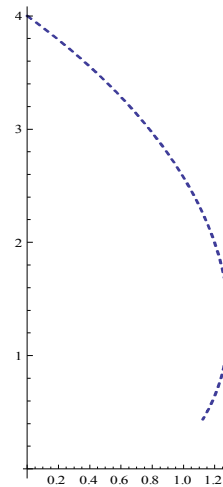
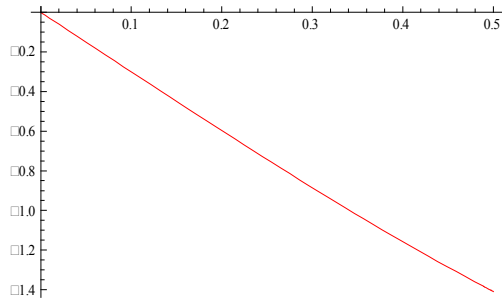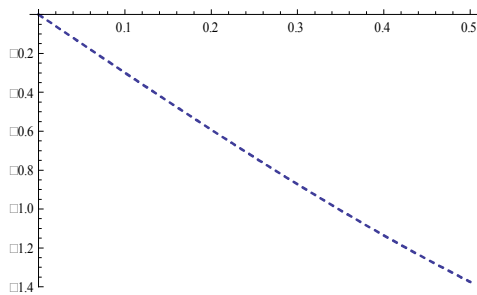

Figure 7: Geometric presentation of the solution with RK's method

Numerical values with RK's method for the system (3) are obtained in Table 7:

```
xn      y1          y2
0.      0.          4.
0.2     0.8         3.2
0.4     1.24331     2.36331
0.6     1.41028     1.58496
0.8     1.38053     0.921225
1.      1.22535     0.397554
1.2     1.00359     0.0167703
```

Table 7: Numerical values via RK's method for (3)

The graphic presentations from figure 5, figure 6 and figure 7 are presented on the same 2D system in figure 8:
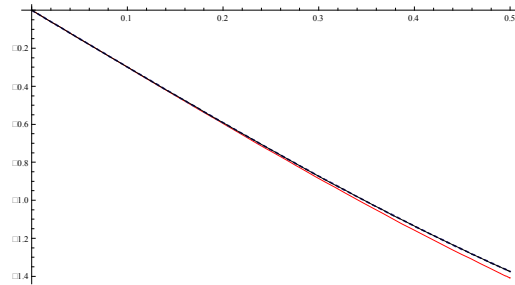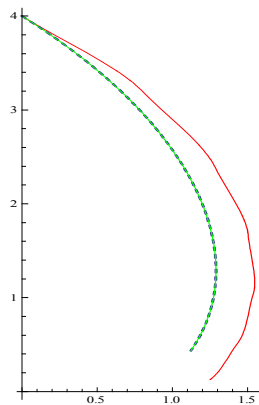

Figure 8: Geometric presentations of the exact solution and the solution via Euler's and RK's method

From the figure 8, we notice that the geometric presentation obtained with RK's method is closer to the exact solution of the mathematical spiral (3) than the geometric presentation obtained with Euler's method. In the table 8 is obtained the result for the solution $y_1(x)$:

x	y1	Euler's method for y1	Absolute error for Euler's method for y1	RK's method for y1	Absolute error for RK's method for y1
0	0	0	0	0	0
0.2	0.650627	0.8	0.149373	0.8	0.149373
0.4	1.04414	1.28	0.23586	1.24331	0.19917
0.6	1.23953	1.504	0.26447	1.41028	0.17075
0.8	1.28932	1.536	0.24668	1.38053	0.09121
1	1.23824	1.43488	0.19664	1.22535	0.01289
1.2	1.1229	1.25133	0.12843	1.00359	0.11931

Table 8: Comparison of the absolute errors between Euler's method and RK's method for the mathematical spiral (3)

From the table 8, we can conclude that the absolute error made with the numerical Euler's method is smaller than 0.3, but the absolute error made with the numerical RK's method is smaller than 0.2 for the same considered interval.

Identically as in example 1, from the graphical presentations and the considered tables can be concluded that the numerical RK's method is better for the numerical solving of the ODE than the numerical Euler's method.

III.   CONCLUSION

Using mathematical software Mathematica for presenting this examples is more than needed because they give us a visualization of the chosen problems. For greater precision on the charts and accuracy of the results, we take more values for xn. As we have mentioned above from the examples we concluded that the numerical RK's method is better for the numerical solving of the ODE than the numerical Euler's method.

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Application of Machine Learning in Software Engineering

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Abstract - The purpose of the software manufacturing industry is to produce high-quality applications that meet the requirements of customers and users who live long, that are easy to use and have as few errors as possible. Building such an ideal software is a relatively difficult process. To be successful in this industry, a specific discipline is needed when designing and developing software. There is therefore an engineering perspective on the whole process.

Many companies and individuals still develop software chaotic, based on a poor analysis, which leads to unsuccessful outcomes such as software failures that fail to meet the expected requirements. Software Engineering applies to optimize these phenomena.

I. INTRODUCTION

Software Engineering - The purpose of the software manufacturing industry is to produce high-quality applications that meet the requirements of customers and users who live long, that are easy to use and have as few errors as possible. Building such an ideal software is a relatively difficult process. To be successful in this industry, a specific discipline is needed when designing and developing software. There is therefore an engineering perspective on the whole process.

Many companies and individuals still develop software chaotic, based on a poor analysis, which leads to unsuccessful outcomes such as software failures that fail to meet the expected requirements. Software Engineering applies to optimize these phenomena.

Machine learning does the statistical analyses is of data and extract and use most relevant data for solving the current situation or for prediction of future events. Machine Learning is the branch of Artificial Intelligence. Machine learning means skills to learn things from activities as well as conditions that give relevant results. It became a well-known topic due to its usages and therefore many people are trying to learn it. The Learning for machines is nothing but to become more familiar with the thing in such a way that can help in many ways like weather prediction, recommendation based on the taste, deciding route in traffic, diagnosing samples with most accurate output, etc.

Machine learning (ML) is not hard. Machine learners automatically generate summaries of data or existing systems in a smaller form. Software engineers can use machine learners to simplify systems development. This chapter explains how to use ML to assist in the Designing a simulator for monitoring CPU temperature through fan speed control based on Fuzzy Logic theory.

A. Software applications and their categorization

Whenever there is an algorithm for solving a problem, the latter may be subjected to a software application for solving it (except for some cases of Artificial Intelligence). Content of information and the selective are two very important factors that affect the nature of a software application.

- The content of the information relates to the meaning and form of input and output information circulating in the application. Examples of possible forms of information are files, databases and data structures, images, inputs from peripheral devices, and so on.

- Determination of information refers to the predictability of the order and the time of exchange and manipulation of information. Applications that receive a particular data format that apply a certain algorithm and instructions on a timely basis are called determinant applications. An application is called non-determinant if it has variants of information content, arbitrary execution of instructions and algorithms that may be interrupted by external factors whose output varies depending on the environment and time. A multiuser

operating system, for example, is not decisive. Such applications are usually more complex and more difficult to manage.

Though in the wide range of applications used today it is difficult to make a clear categorization, it is necessary to set inclusive spaces for study purposes for them. Such are:

- **Software systems.** System software is a set of programs that serve other programs. Such are compilers, parsers, file management systems, drivers, operating systems, and so on. These applications are characterized by:

  ▪ Close interaction with hardware

  ▪ Multi-user

  ▪ Simultaneous actions

  ▪ Complex data structure

  ▪ Many external interfaces

- **Real-time systems.** These types of software monitor, analyze, and control real-world events as they occur. These applications are characterized by:

  ▪ Components that collect data from an external environment and format them for manipulation.

  ▪ Components that analyze information and transform according to application requirements.

  ▪ Components that control output.

  ▪ Steering components that coordinate the work of other components so that the system responds in real time.

- **Business Software.** This is also the largest category of software. These applications mainly deal with the storage and access to data related to business information. Typically, they are characterized by normalized and large-scale databases as well as high user interactivity.

- **Scientific and engineering software.** These software almost always include algorithms and complex calculations. Fields of application are astronomy, molecular biology, applied mathematics, physics and so on. Today, scientific software is not just software calculator but is trying to simulate, interact with systems and feature real-time software.

- **Interfaced Sotware.** Software that comes as part of the industry and its products. These software stay in the short-term memory of the device and serve to control and automate its work. Embedded software can perform only a few limited functions, limited is the interaction of users with these systems.

- **Software for personal computers.** The software market for personal computers has occupied a lot in the overall production of software industry. There are many examples: word-processing software, graphics, personal, multimedia, games, access to databases, etc.

- **Web-based software.** They are accessed through browsers and are based on the worldwide network of computers, the Internet. The data in it is presented in various forms and easily accessible to the user, such as hypertext and multimedia formats. Every day the importance and demand for these kinds of applications increases due to increased demands for communication and exchange of information between individuals and companies.

- **Artificial Intelligence Software.** Use non-numeric algorithms to solve complex problems that cannot be solved by traditional methods. Such are expert systems, knowledge-based systems, neutral nets, proofing of theorems, intelligent games etc.

In addition to the above categories, the software is also divided into two large groups: custom and custom-built custom software. One of the most noticeable changes from the point of view of engineering of these two different categories is the fact that in the first case the specifications are controlled by the development organization itself, whereas in the second case the specifications are determined by the organization which orders the program. However, the boundary between these categories is somewhat unclear. It often happens that companies start with a general product and later begin to tailor the product depending on the requirements of potential customers.

B. *Methodology and research results - Machine Learning in Software Engineering*

Machine learning deals with the issue of how to build computer programs that improve their performance at some tasks through experience. Machine learning algorithms have proven to be of

great practical value in a variety of application domains. Not surprisingly, the field of software engineering turns out to be a fertile ground where many software development and maintenance tasks could be formulated as learning problems and approached in terms of learning algorithms.

Machine learning is practical for software engineering problems, even in data-starved domains. When data is scarce, knowledge can be farmed from seeds; i.e. minimal and partial descriptions of a domain. These seeds can be grown into large datasets via simulations. The datasets can then be harvested using machine learning techniques. Examples of this knowledge farming approach, and the associated technique of data-mining, is given from numerous software engineering domains.

Machine learning (ML) is not hard. Machine learners automatically generate summaries of data or existing systems in a smaller form. Software engineers can use machine learners to simplify systems development. This chapter explains how to use ML to assist in the Designing a simulator for monitoring CPU temperature through fan speed control based on Fuzzy Logic theory.

C. Fuzzy Logic

The Fuzzy Logic Toolbox for use with MATLAB is a tool for solving problems with fuzzy logic. Fuzzy logic is a fascinating area of research because it does a good job of trading off between significance and precision-something that humans have been managing for a very long time.

Fuzzy logic sometimes appears exotic or intimidating to those unfamiliar with it, but once you become acquainted with it, it seems almost surprising that noone attempted it sooner. In this sense fuzzy logic is both old and new because, 1-3 although the modern and methodical science of fuzzy logic is still young, the concepts of fuzzy logic reach right down to our bones.

D. Create Application of Machine Learning using Matlab – Fuzzy Logic Toolbox

The Fuzzy Logic Toolbox allows you to do several things, but the most important thing it lets you do is create and edit fuzzy inference systems. You can create these systems by hand, using graphical tools or command-line functions, or you can generate them automatically using either clustering or adaptive neuro-fuzzy techniques.

If you have access to Simulink, the simulation tool that runs alongside MATLAB, you can easily test your fuzzy system in a block diagram simulation environment. If you have RealTime

Workshop capabilities available, you can generate realtime or non-realtime code from the Simulink environment.

The toolbox also lets you run your own stand-alone C programs directly, without the need for Simulink. This is made possible by a stand-alone Fuzzy Inference Engine that reads the fuzzy systems saved from a MATLAB session (the stand-alone code, unlike that generated by the Real-Time Workshop, does not run in real time). You can customize the stand-alone engine to build fuzzy inference into your own code. All provided code is ANSI compliant.
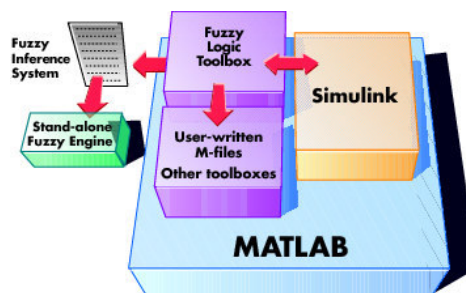
Figure 1 - Matlab's integration scheme

Because of the integrated nature of MATLAB's environment, you can create your own tools to customize the Fuzzy Logic Toolbox or harness it with another toolbox, such as the Control System, Neural Network, or Optimization Toolbox, to mention only a few of the possibilities.

E. Designing a simulator for monitoring CPU temperature through fan speed control based on Fuzzy Logic theory

The CPU temperature ranges from 0 to 110°C, the work of the computer must be stopped above this temperature. The fan usually works at four rotational speeds.
Let's look at the use of the Fuzzy Logic Regulator in this case.

1. If the temperature is 0 to 30°C then the fan rotates at a low speed, speed 1
2. If the temperature is between 30°C and 60°C then the fan rotates at an increased speed: speed 2
3. If the temperature is between 60°C and 90°C then the fan rotates at normal speed: speed 3
4. If the temperature is between 90°C and 110°C then the fan rotates at a high speed: speed 4

These are also the rules of the Fuzzy Logic Regulator.

The FL-FIS file Regulator is the CPU temperature of 0°C to 110°C. The FIS-FL file will be named the Sugeno type *ventilatori*.

Exit from Regulator FL should be the speed of fan rotation, i.e. speeds 1, 2, 3 and 4.

Let's present the FL rules in tabular form:

Speed of fan / Temperature of the CPU	Low Speed (shV)	Average speed (shm)	Speed normal (shN)	High speed (shM)
0°C to 30°C (tV)	X			
30°C to 60°C (tm)		X		
60°C to 90°C (tN)			X	
90°C to 110°C (tM)				X

Input, CPU temperature "T" it should be assumed that it may be in the interval [0, 110], and this interval is divided into sub-intervals that are accompanied by language names:

tV: Low Temperature [0, 30] ,
tm: Average temperature [30, 60],
tN: Normal temperature [60, 90],
tM: High temperature [90,110], see Figure 2.
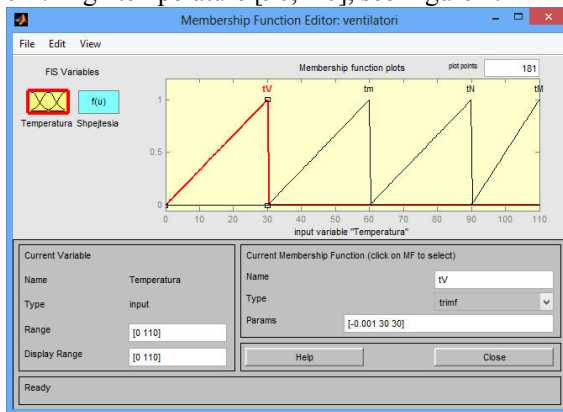
Figure 2 - Incoming Variable - CPU Temperature

Output, the swing speed of the fan "sh" should be assumed to be within the interval [1, 4], (because the fan starts rotating as soon as the computer is switched on) and this interval is divided into subintervals that are associated with the language names:

shV: the speed of the fan rotation is small,
shm: the speed of the fan rotation is average,
shN: the speed of the fan rotation is Normal,
shM: the speed of the fan rotation is high, Figure 3.
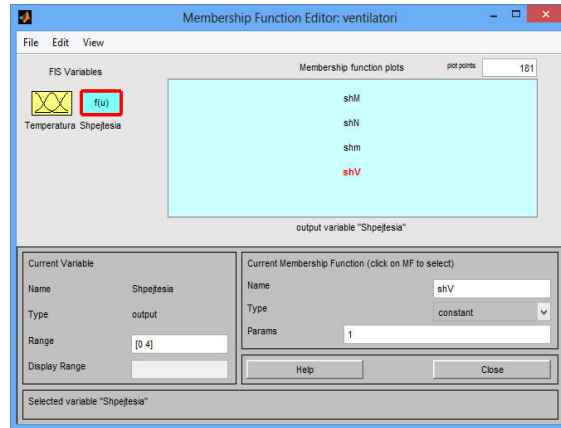
Figure 3 - Outbound Variable - Fan Speed Rotation
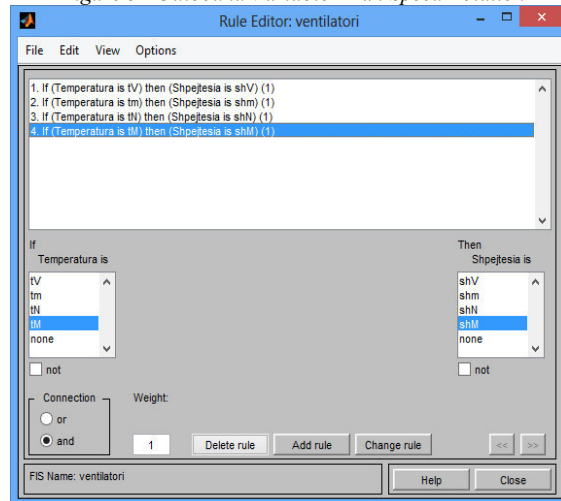
Figure 4 - Rule set for FIS-FL
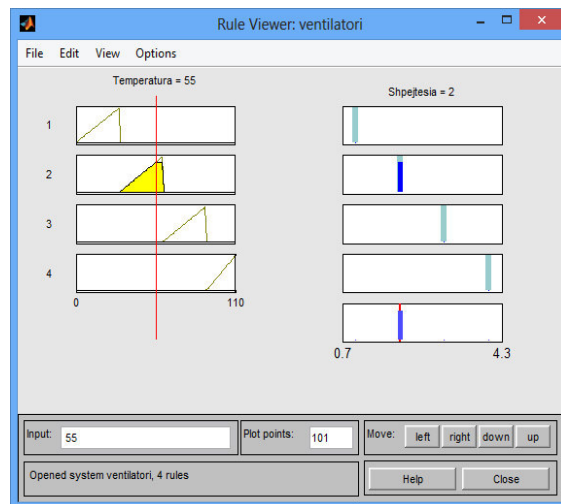
Figure 5 - Rules from the "View> Rules" menu

29
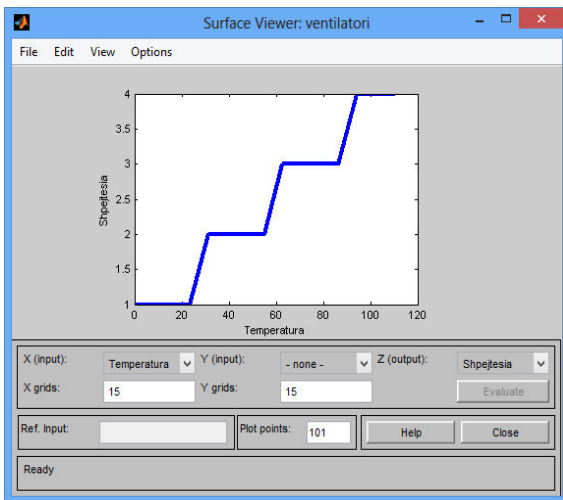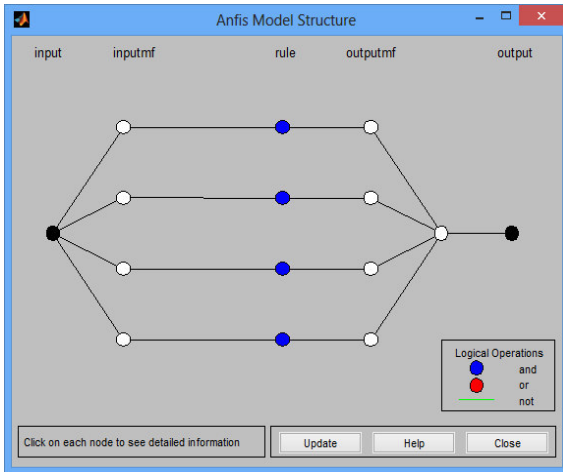
Figure 6 - Edit view> Anfis> Structure of FIS-FL and Rules from the "View> Surface" menu

After we have saved FL in the fan, in the file-fis and "File> Export> To Workspace". In the "Workspace" window, click on the right mouse button and save it as **ventilatori.mat** so that you can more easily activate FIS-FL in the **ventilatori**.
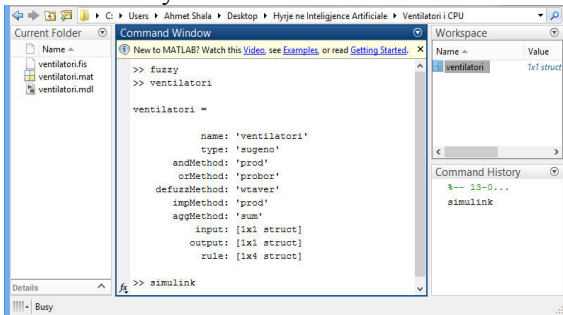
Figure 7 - Maintain FIS-FL

Using FL 'ventilatori" in Matlab> simulink
In the "Command Window" we write "simulink" and open a new model "File> New Model", we name ventilatori.mdl, we also simulated the change

of CPU temperature through the absolute value of sinusoidal function with amplitude 120 and frequency 0.5, designed as follows:
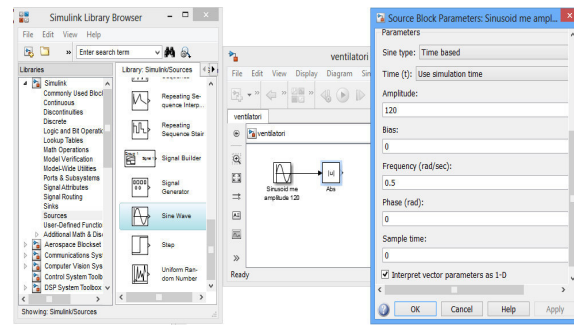
Figure 8 - Simulation of the CPU fan controller, being designed

We have designed the Fuzzy Logic Regulator for CPU temperature control and saved it as **ventilatori.fis** respectively **ventilatori.mat**.
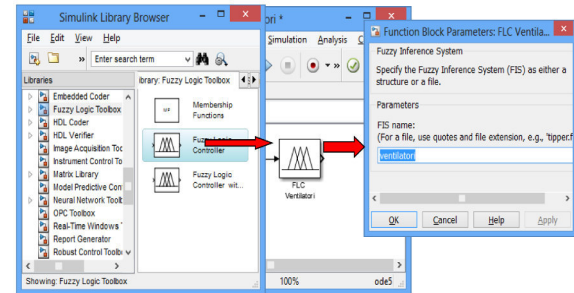
At the output, set a "Scope" to display the fan speed chart.
The simulation parameters are given below:
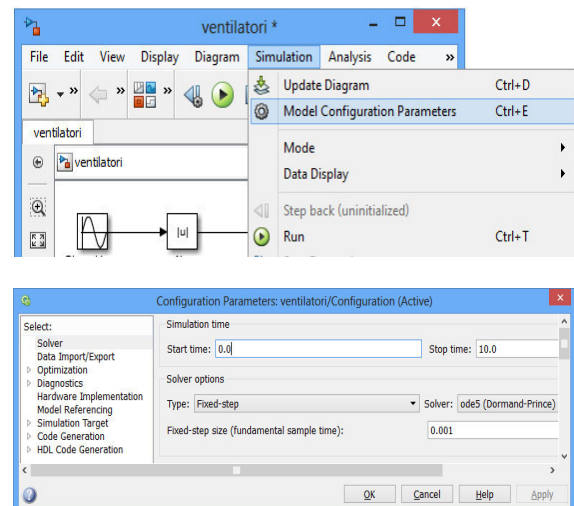
The simulation is finally presented in Figure 9.
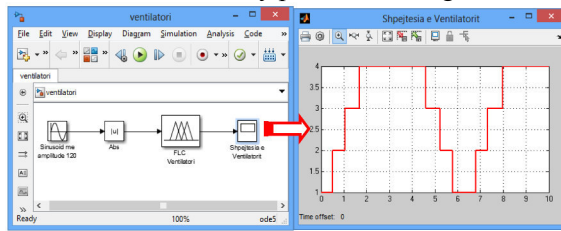
Figure 9 - CPU fan speed control simulation model

To simulate the next time, you do not need to activate the regulator in Command Window, we will automatically run the ventilatori.mat, when launching the ventilatori.mdl model, by doing the following:
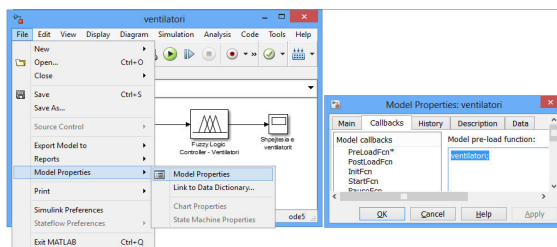
II. CONCLUSION

Software engineering really involves a lot of analytical and documentary work and less coding. Usually as software engineers have been named creative individuals, with new ideas, who know

how to manage a project and who certainly have enough programming experience. Professional ethics and software applications and their categorization.

Design of a CPU temperature monitor simulator through fan speed control based on Fuzzy Logic theory. The step-by-step process of processing the application for CPU temperature monitoring through the fan speed control is described. The result of the work, this is going to work machine-learning.

We used 4 types of speed and the machine should know which fanter quickly worked. The first speed works if the temperature is between 0 to 30°C, the second speed between 30°C and 60°C, the third speed between 60°C and 90°C and the speed 4 between 90°C and 110°C. Application of Machine Learning in Software Engineering is done in MatLab, and the result is successful based on the presentation.

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QtQuick Mobile Application Development

A Model/View Car Service application built using Qt/QtQuick

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Abstract – The paper presents the QtQuick development process through a simple Adnroid application for auto service shops and their clients. The aim of this paper is to teach the person various QtQuick components.

I. INTRODUCTION

Bonnet is a cross-platform (primarily Android) application using Qt technologies such as QtQuick, QtQuick Controls, and other Qt modules.

It's a Model/View application that stores its data in a SQLite database.

The application allows you to request services from Auto repair shops for your motor vehicles and keep track of your past auto services.

II. TECHNOLOGIES USED

A. Qt Framework

Qt is used for developing graphical user interfaces (GUIs) and multi-platform applications that run on all major desktop platforms and most mobile or embedded platforms. Most GUI programs created with Qt have a native-looking interface, in which case Qt is classified as a widget toolkit. Also, non-GUI programs can be developed, such as command-line tools and consoles for servers.

Qt supports various compilers, including the GCC C++ compiler and the Visual Studio suite and has extensive internationalization support. Qt also provides Qt Quick that includes a declarative scripting language called QML that allows using JavaScript to provide the logic. With Qt Quick, rapid application development for mobile devices has become possible, while logic can still be written with native code as well to achieve the best possible performance.

Other features include SQL database access, XML parsing, JSON parsing, thread management and network support. [1]

B. Qt Creator

Qt Creator is a cross-platform C++, JavaScript and QML integrated development environment which is part of the SDK for the Qt GUI application development framework. It includes a visual debugger and an integrated GUI layout and forms designer. The editor's features include syntax highlighting and autocompletion.

Qt Designer is a tool for designing and building graphical user interfaces (GUIs) from Qt widgets. It is possible to compose and customize the widgets or dialogs and test those using different styles and resolutions directly in the editor. Widgets and forms created with Qt Designer are integrated with programmed code, using the Qt signals and slots mechanism.

Qt Quick Designer is a tool for developing animations by using a declarative programming language QML. [2]
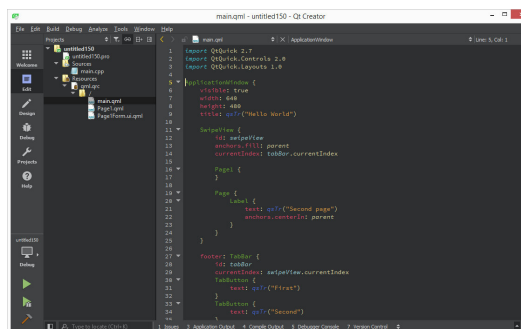
Figure 1 Qt Creator

C. SQLite

SQLite is a relational database management system contained in a C programming library. In contrast to many other database management systems, SQLite is not a client–server database engine. Rather, it is embedded into the end program.

SQLite is ACID-compliant and implements most of the SQL standard, using a dynamically

and weakly typed SQL syntax that does not guarantee the domain integrity. [3]

D. Android SDK

The Android software development kit (SDK) includes a comprehensive set of development tools. These include a debugger, libraries, a handset emulator based on QEMU, documentation, sample code, and tutorials. Currently supported development platforms include computers running Linux, macOS, and Windows. [4]

E. Android NDK

The Native Development Kit (NDK) is a set of tools that allows you to use C and C++ code with Android and provides platform libraries you can use to manage native activities and access physical device components, such as sensors and touch input. The NDK can be useful for cases in which you need to do one or more of the followings:

- Squeeze extra performance out of a device to achieve low latency or run computationally intensive applications, such as games or physics simulations.

- Reuse your own or other developers' C or C++ libraries. [5]

III. APPLICATION DESIGN

QML is a user interface markup language. A user interface markup language renders and describes graphical user interfaces and controls. QML is a part of the Qt framework. However, as QML was created initially for rapid creation of UIs and animations, you can now use it for writing your app or game logic with a component based approach. Also, you can mix JavaScript with QML easily and make any app or game you like with it.

The C++ backend exposes types and models to the QML frontend which then displays the model data using item delegates.

Qt Creator IDE and the various tools included were used to develop and deploy this application.

SQLite was used for the prototype which means the database is only available locally on the device.

The application would eventually use internet-facing database technologies such as MySQL and PostgreSQL instead.

The following pages are all displayed in a StackView widget.

StackView implements a stack-based navigation model, which can be used with a set of interlinked information pages. Items are pushed onto the stack as the user navigates deeper into the material, and popped off again when he chooses to go back. [6]

Each page is an Item.

The Item type is the base type for all visual items in Qt Quick.

All visual items in Qt Quick inherit from Item. Although an Item object has no visual appearance, it defines all the attributes that are common across visual items, such as x and y position, width and height, anchoring and key handling support.

The Item type can be useful for grouping several items under a single root visual item.

The application displays a selection screen during the first run. This screen lets you choose your account type and then displays the appropriate Log In page.

The application runs in two modes:

1. User
   - Meant for clients. Lets users schedule repairs, etc.
2. Mechanic
   - Meant for auto repair shop mechanics. Lets mechanics manage their repair schedule.
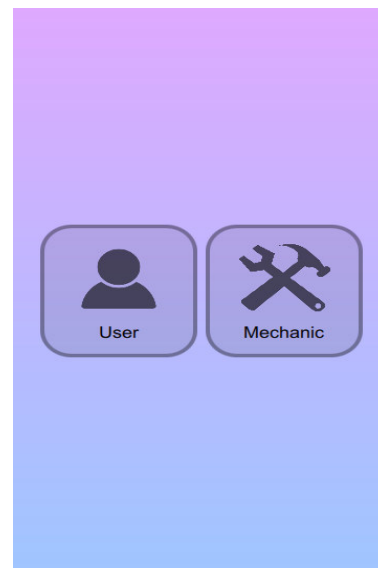
Figure 2 Selection page

Figure 3 Service list page

This page contains the entire history of services associated with the account.

Information is retrieved from the database using a QSqlQueryModel and is sorted using a QSortFilterProxyModel because sql query models are immutable.

List items are sorted by request date in ascending order (new request are displayed on the top) and are categorized in three sections:

1. Not started (New requests not yet reviewed by the repair shop)
2. In progress (Requests that have been accepted and are currently being worked on)
3. Completed (Services that have been completed)

Clicking on a list item will bring up information about the service.

The tool bar on the top of the application is a ToolBar QML element.

It features a set of buttons for:

- Opening the menu drawer
- Navigating to the previous page in the stack
- Creating a new service request and the title of the current page.

The Drawer contains a ListView with a model of all available pages that the user can navigate to.

The ListView QML element has a footer section. In this case, the footer section contains the "Log out" button.

A custom element on the top contains the profile picture, first and last names, username and email.
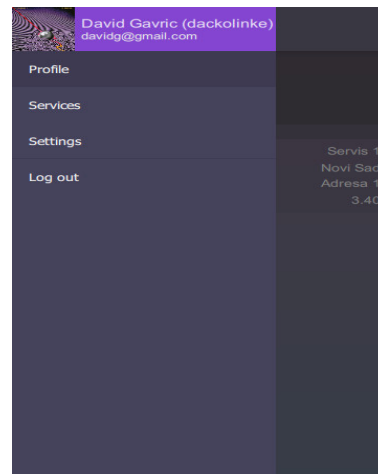
Figure 4 Drawer sidebar

A Drawer can be interactive, meaning the user can swipe across the left edge to activate it. Drawers with interactive set to false can only be opened by the app itself.

Drawer can be positioned at any of the four edges of the content item

Drawer is a special type of popup that resides at one of the window edges. By default, Drawer re-parents itself to the window overlay, and therefore operates on window coordinates

Figure 5 Service overview page

The service overview page displays information associated with a service

Information displayed:

- Request/start/end dates
- Service request description
- Auto repair shop information (name, location, rating)
- Vehicle information (manufacturer, model, etc.)

Once the request is accepted, the mechanic is assigned to the request and the information gets displayed on the page.

The mechanic can also see the "Complete this service" button for services that is still in progress.

Clicking on this button will mark the request as complete.
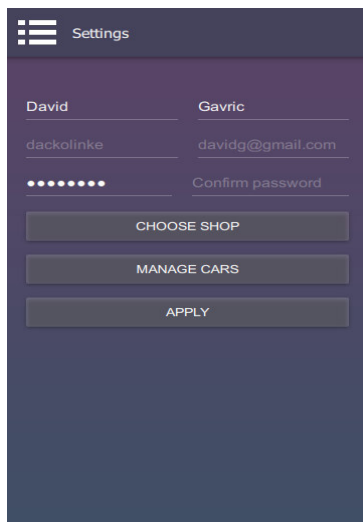
Figure 6 Settings page

The settings page lets the user modify account information such as:

- First name
- Last name
- Password
- Selected auto repair shop
- Vehicle list

Clicking the "Choose shop" button brings out a popup with a list of all registered Auto repair shops with a section for each city.

Clicking the "Manage cars" button brings out a popup with a list of your vehicles.

You can add a vehicle to this list by clicking the "Add vehicle" button.

A car is defined by the following information:

- Manufacturer
- Model

- Year of manufacturing
- Colour

Code snippets

The getServiecsForUser method returns a model containing all service requests associated with the user.

```
QSortFilterProxyModel *DatabaseManager::getServicesForUser(int userId)
{
    SQLiteModel *model = new SQLiteModel;
    QStringList columns;

    columns << "id" << "userId" << "carId" << "shopId"
            << "mechanicId" << "description" << "requestDate"
            << "startDate" << "endDate" << "status";
    model->setColumns(columns);
    model->setQuery(
            QString("SELECT *"
                    "FROM services"
                    "WHERE userId='%1'"
                    "ORDER BY"
                    "requestDate DESC")
            .arg(userId));

    QSortFilterProxyModel *proxyModel = new QSortFilterProxyModel;
    proxyModel->setSourceModel(model);
    proxyModel->setDynamicSortFilter(true);
    proxyModel->setSortRole(Qt::UserRole + 9 + 1);
    proxyModel->sort(0, Qt::AscendingOrder);
    proxyModel->invalidate();

    return proxyModel;
}
```

qmlRegisterType is used to integrate C++ types with QML.

```
qmlRegisterType<DatabaseManager>
        ("com.github.cybre.bonnet", 1, 0, "DatabaseManager");
qmlRegisterType<User>
        ("com.github.cybre.bonnet", 1, 0, "User");
qmlRegisterType<Mechanic>
        ("com.github.cybre.bonnet", 1, 0, "Mechanic");
qmlRegisterType<Shop>
        ("com.github.cybre.bonnet", 1, 0, "Shop");
qmlRegisterType<Service>
        ("com.github.cybre.bonnet", 1, 0, "Service");
qmlRegisterType<Car>
        ("com.github.cybre.bonnet", 1, 0, "Car");
qmlRegisterInterface<SQLiteModel>
        ("SQLiteModel");
qmlRegisterInterface<QSortFilterProxyModel>
        ("QSortFilterProxyModel");
```

All methods meant to be called from QML code must be prefixed with the Q_INVOKABLE macro.

```
Q_INVOKABLE User *getUser(QString username);
Q_INVOKABLE User *getUserById(int userId);
Q_INVOKABLE Mechanic *getMechanic(QString username);
Q_INVOKABLE Mechanic *getMechanicById(int mechanicId);
Q_INVOKABLE Shop *getShop(int id);
Q_INVOKABLE Service *getService(int id);
Q_INVOKABLE Car *getCar(int id);
Q_INVOKABLE SortModel *getServicesForUser(int userId);
Q_INVOKABLE SortModel *getServicesForMechanic(int mechanicId);
Q_INVOKABLE SortModel *getShops();
Q_INVOKABLE SQLiteModel *getCarsForUser(int userId);
Q_INVOKABLE QString getLoggedInUser();
Q_INVOKABLE QString getLoggedInMode();
Q_INVOKABLE void logOut();
Q_INVOKABLE bool logIn(QString userName, QString password,
                       QString table);
Q_INVOKABLE bool registerUser(QString firstName, QString lastName,
                              QString userName, QString email,
                              QString password, QString table);
Q_INVOKABLE void requestService(int userId, int carId, int shopId,
                                QString description);
Q_INVOKABLE void addCarForUser(int userId, QString manufacturer,
                               QString model, int year, QString color);
```

QObject based classes used in QML define their getter and setter methods using the Q_PROPERTY macro.

```
Q_PROPERTY(int userId READ userId)
Q_PROPERTY(QString firstName READ firstName WRITE setFirstName)
Q_PROPERTY(QString lastName READ lastName WRITE setLastName)
Q_PROPERTY(QString userName READ userName)
Q_PROPERTY(QString email READ email)
Q_PROPERTY(QString password READ password WRITE setPassword)
Q_PROPERTY(int shopId READ shopId WRITE setShopId)
```

IV. CONCLUSION

Working with QtQuick has been a very pleasant experience. It allows easy cross-platform development with integrated environments and deployment solutions.

QtQuick Controls ships with a native Android style (Material) but iOS apps can still look out of place because of the lack of a native style.

Projects such as V-Play [7] can remedy this, though.

We believe it's much easier to develop multiple separate applications using different languages and widget toolkits.

QML can be very powerful when mixed with JavaScript but we recommend separating business logic from the graphical interface because it makes a much better and neatly organized code base.

V. REFERENCES

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Towards Software-Defined Vehicular Networks: Recent Achievements

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Abstract - Vehicular ad-hoc Networks (VANETs) have been one of the most promising research direction for the last few years. VANETs use vehicles as mobile nodes to provide communication among nearby vehicles or between vehicles and nearby roadside communication network infrastructure. Development of VANETs has suffered from huge number of connected vehicles, heterogeneous network environments, and complexity of road topology changes. Software-defined vehicular networking (SDVN) provide a solution for these problems, through network centralized control layer and flexibility in programmable developing network infrastructure. By simplifying VANETs complexity and separating control plane from data plane, the SDVN can address major challenges in vehicular networks. This paper is devoted to provide a structured overview of the recent research advances on SDVN vehicular networks and focusing on SDVN challenges and subsequent research directions and important aspects that are currently not-enough surveyed in the literature.

I. INTRODUCTION

VANETs are wireless networks that support cooperative driving among a large number of dynamically moving vehicles on the roads. Communication between vehicles has taken place to establish the ad-hoc network. Vehicles forming highly dynamic vehicular networks together with other nearby vehicles, or with nearby roadside equipment. There are four dedicated communication types in VANETs: in-vehicle, Vehicle-to-Vehicle (V2V), Vehicle-to-Infrastructure (V2I) and vehicle-to-broadband cloud [1].

VANETs are significantly different from conventional wireless communication scenarios and have specific characteristics that distinguish them from typical ad-hoc networks. Many challenges obstruct their applications, such as highly dynamic topology, frequent information interactions, and strict latency requirement. Vehicles are highly mobile and do not move at random. They are limited to known paths road topology while moving, often in a predictable manner or might have only predictable routes. If the road information is available, it is possible to predict the future position of a vehicle or get information about various risk traffic events or accidents. The Wireless Access in Vehicular Environment (WAVE) protocol is based on IEEE 802.11p standard and provides basic radio standard for Dedicated Short-Range Communications (DSRC) operating in 5.9 GHz frequency band [2]. Generally, DSRC/WAVE communication standard and belonging protocols have to consider specific conditions existing in VANETs: RF signal attenuation, effect of obstacle blocking signal propagation, constrained movemen, high velocity and various density determined by traffic demand that changes over time and space.

The software-defined network concept is innovative in the vehicular networking field, and it is now considered a new, alternative approach for controlling the data flow of the entire network in the programmable mode. The SDVN introduces a centralized control structure which dynamically configures all underlying hardware based on user/vehicle specific application requirements [3]. Furthermore, vehicular equipment or RF devices are simply reconfigured in SDVN by adding a network programmability feature to vehicular networks through external applications. Therefore, SDVNs enable simple management and flexibility in developing vehicular network infrastructure. Other important features of SDVN, such as dynamic network resource allocation, centralized control, scalability and flexibility can satisfy the requirements for modern VANETs [4].

The remainder of this paper organized as follows. Section II provides the basic concepts of VANETs communication architecture and background to SDVN principles. Section III gives a perspective on open research challanges and recent advances made in SDVN communication framework, while Section IV presents an overview

of some of the recent solutions. Concluding remarks are given in the Section V.
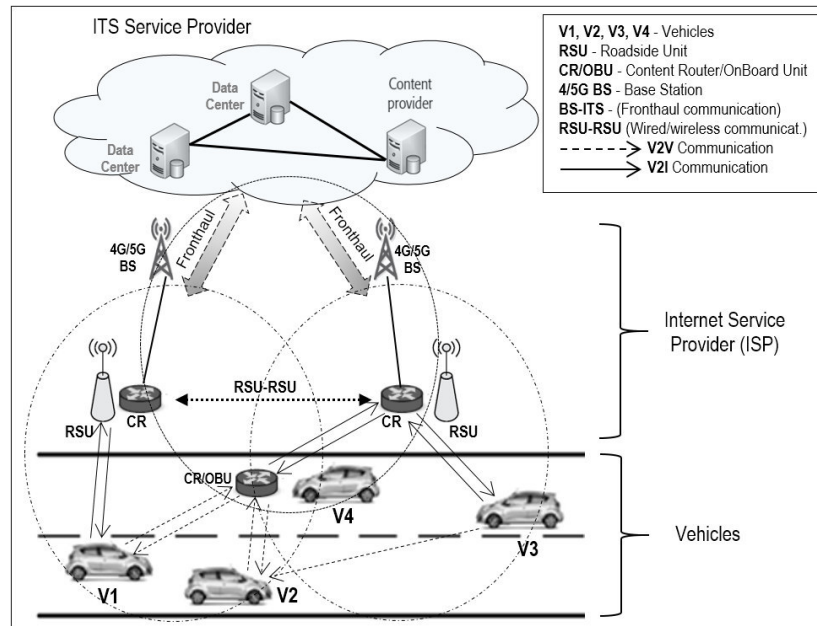
Figure 1. Generalized communication arhitecture of VANET

II. SOFTWARE-DEFINED VEHICULAR NETWORKING ARCHITECHTURE

A. The global VANET communication architecture

We presented a generalized communication architecture of VANET, as shown in Figure 1. This architecture consists of three main parts: the vehicles, the network infrastructure managed by an Internet Service Provider (ISP), and the Intelligent Transport System (ITS) service provider processed in the cloud facilities. The general VANET structure can have three-tier hierarchy. As we can see from the Fig. 1, the number of hops from the edge vehicles to the cloud increases, and all vehicles have to go through several intermediate connecting devices (controllers, switches, routers, servers etc.) using different communication technologies.

In a tipical VANET scenario, vehicles equiped with dedicated sensors, systems and OBUs (On-Board Unit) are capable of communicating with adjacent vehicles, establishing V2V connections, and receiving data services from RSU (Road-Side Unit) infrastructures, celular 4G/5G base stations (BSs) and WiFi APs (Access Point), all of which are regarded as V2I communications [5]. The CRs (Content Router) are realized as part of vehicle OBU and RSU respectively, and play main role in

data exchange and content retrieving. Depending on vehicle location, important informations about traffic environment can be reached only by a RSU (vehicles V1-V4), or both RSU and BS (vehicle V4), or it may be out of any network coverage. A vehicle acts not only as an end node, but also as a CR to transmit information to other vehicles. A vehicle can be equipped with several interfaces (4/5G, DSRC, wireless short-range etc.) allowing it to interact with the various BSs, RSUs entities, ITS cloud and connected objects that surround it.

The VANET infrastructure is composed of two parts: RSU and cellular network platform controlled by an ITS service provider. The RSU may be interconnected via a wired/wireless link, and they can not only provide a local service but also a cloud service and/or Internet access to the different vehicles. Current cellular solutions (4G/5G) can almost entirely be adopted by the VANETs [6]. The cellular network has a very high network capacity enabling it to support applications requiring high throughput demands. The BS offers multicast/ broadcast transmission services which can be used tn an ITS system. BSs can provide wireless communication for vehicles and RSUs. In VANETs, BSs transmit wireless signals by traditional 4G/5G frequency and provide broad coverage for vehicles. Mainly, vehicles first access with RSUs but then access

with BSs when RSUs cannot provide enough resource for wireless access in vehicular networks.

The ITS core cloud provides some important functions, including mobility management, virtualized resouce management, interference management and has a high storage and processing capabilities to collect data, and process them to provide customized ITS services to different vehicles. Mobile edge computing platforms are deployed in the edge cloud, in conjunction with content storage servers and distributed data-centers, which can execute the storage, computing, and transmission of massive data in a real-time and efficient way [7].

B. SDVN principles and architecture design

Going forward, contemporary VANETs need to be more sophisticated in their incorporation of today's new services and technologies, and flexible in their ability to turn various services off and on as needed. SDVN introduces capability into VANETs to improve network efficiency and adding a network programmability feature through external applications. Additionally, SDVN permits independent deployment of control, traffic forwarding and processing entities. Other noticeable features of SDVN, such as centralized control and dynamic network resource allocation, can satisfy the requirements for modern VANETs. SDVN integrates a network programmability feature in VANETs to provide a new pool of services, such as safety measures, and virtualization of network infrastructure. SDVN operational modes enable VANETs to adapt to changes in high dynamic network topology [8].

Figure 2. illustrates the architecture of SDVN. The general SDVN architectural framework consists of three hierarchically-based layered components: application plane, control plane and data plane.

The application plane directly faces diverse application requirements from users/vehicles and interfaces with the various vehicular applications and services, either providing services or requesting access to the network. Furthermore, the application plane includes the content distribution, the service efficiency module, the security service module adaptive deployment module etc. Based on application requirements from vehicles, rules of SDVN are generated by the application plane and forwarded to the control plane [9].

The control plane sits in the center of the programmable network architecture and serves as the network information database and control point. The control plane is a logically centralized control layer, organized as SDVN controller. The SDVN controller is a key structure, responsible for managing packet forwarding decisions and network intelligence. It manages the behavior of the entire network. The control plane has two main modules: services manager and forwarding manager. Services manager responsible for quality of services (QoS) requirements and for managing the incoming requests [10]. Forwarding manager responsible for routing the data, and analyzing the vehicular or network topology status.
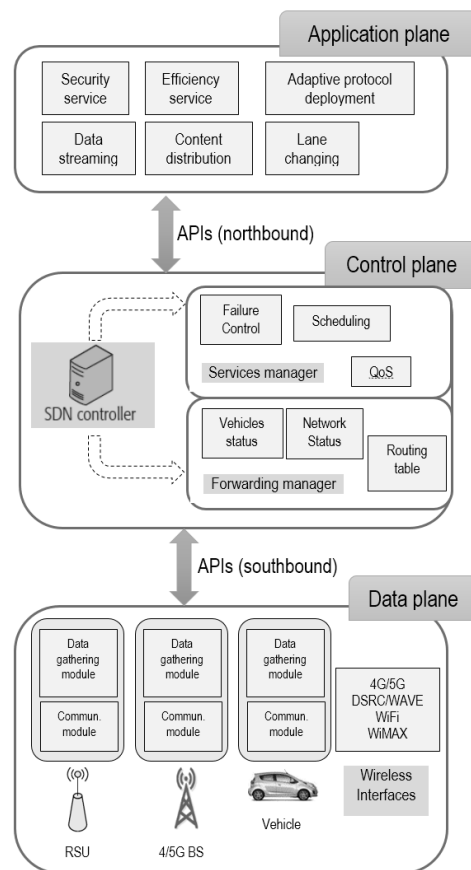
Figure 2. SDVN logical framework architecture

Basic elements of data plane (or forwarding plane) are vehicles, RSUs and BSs devices. Functions of the data plane are focused on handling packets and data collection, quantization, and then forwarding data into the control plane. The data plane also provides forwarding resources and also controls the flow to routers/switches via related interfaces.

The SDVN controller provides APIs in the northbound directions in order to interact with network applications, while the southbound interface refers to the communication between the control and the data plane.

The core concept of SDVN is the separation between the network control plane and the data forwarding functions [11]. The SDVN controller represents software application running on a powerful server computer that has a standard southbound interface such as OpenFlow to communicate with access devices (RSUs, BSs, vehicles etc.). OpenFlow is the most commonly used protocol for communication between the SDVN control plane and data plane, and gives access to the forwarding plane of a network switch/router over the vehicular network [12].

III. SDVN - OPEN RESEARCH CHALLENGES

Some primary and significant research issues are still open to be able to fully establish the contribution of the proposed SDVN architecture. We have identified some of these areas and this section discussed the key challenges to the imlementation of SDVN, and the current state-of-the art research with a particular focus on architecture design, network frimework and data management.

Researchers try to define vehicular architectures that are capable of supporting the existing 4/5G, DSRC, WiFi and WiMAX RF technologies. Although, there have been several proposals in literature, there is still no clear definition of an architecture capable of dealing with increasing improvements of the existing mechanisms [13]. Heterogeneous VANETs by integrating different access networks is expected to be a efficient solution to satisfy various communication requirements for ITS services. A heterogenous SDVN network globally contains two distinct network objects, classified as either an SDVN controller or an SDVN agent. The controller is responsible for managing the control plane and it is logically centralized. The SDVN agent can communicate with the conrtoller and contains the intelligence necessary to act as the controller itself in particular situations. SDVN agent abstracts the underlying network resources, such as RSUs, BSs and vehicles as SDVN switches, making their heterogeneity transparent.

The SDVN controller manages the flow forwarding state in the data plane and enables programmability principles for the data plane. In the vehicle traffic scenario, the topology changes as the vehicle moves, so the topology management in the SDVN controller needs to acquire position, direction, velocity, and network connectivity in real time. Controller is logically centralised entity but physically distributed and enables the concept of virtualization.

The OpenFlow network involving the two components: OpenFlow controller and several OpenFlow-enabled switches. The OpenFlow switch consists of one or more flow, meter and group tables which perform packet lookups and forwarding [14]. Each SDVN switch dinamically maintains a flow table, which consists of flow rules (entries) that determine the handling of packets. Flow entries consist of match fields, instructions and counters. Figure 3 (left) depicts the flow algorithm of a packet in OpenFlow. The match field entry is used to match the incoming packets. When a packet is received, the header is extracted upon which the relevant fields are matched against the flow table entries. If they match, the instruction set included in that flow entry is executed. If a packet does not match the flow entry in the flow table, a further procedure that includes packet dropping, passing to another table, or sending to the controllers depends on the table configuration. Counters collect flow statistics, and the instruction field determines what action should be taken upon a packet match.
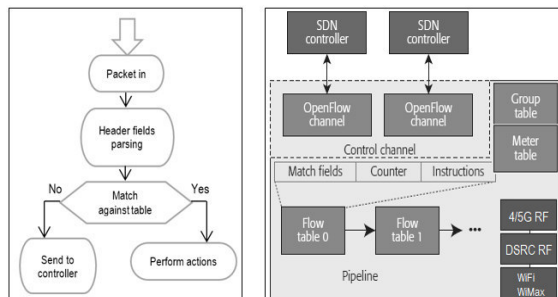
Figure 3. Packet forwarding flow algorithm in OpenFlow (left), OpenFlow communication model (right)

The SDVN switch communicates with the controller using a unified interface and dedicated control channel, as shown in Figure 3 (right). One of the main research challenges of SDVN development is the standardization of OpenFlow APIs and network security considerations. One of the features of the OpenFlow protocol is optional transport layer security (TLS) for control channel security. However, TLS does not implement TCP-level protection and is not reliable and OpenFlow is prone to TCP-level attacks.

There are a numerous of open security issues in SDVNs that need to be carefully taken into consideration. Open northbound API allows developers from different vehicular research areas to develop a network application, as opposed to only equipment vendors. However, northbound API faces two important challenges: the lack of standardization and deficient design. As a direct result, there are dozens of different SDVN controllers that are currently available feature varying northbound APIs. Security threats in SDVN should be fully analyzed to design the corresponding security applications or even to restructure the proposed architecture, as described in [15].

increase in devices and services, more data is being generated, and thus we need to have sophisticated algorithms to search the required content.

IV. SDVN - RECENT SOLUTIONS OVERVIEW

Increasing application of SDVN framework in several vehicular network domains and settings have emphasized areas of concern ranging from application performance to security. As SDVN becomes more widely adopted and a new protocols are further defined, new solutions are proposed and new challenges arise.

One of the main goals is improving the

TABLE I SOME OF THE RECENT SOFTWARE-DEFINED VEHICULAR NETWORK SOLUTIONS

Solution	Architecture	Communi-cation	Brief solution description
SDVN NDN [16]	Hierarchical	V2V, V2I	- Integration of NDN in SDVN environments to increase service to retrieve the required content using named-data networking
Hierarchical-based SDVN [17]	Hierarchical	V2V, V2I	- The hierarchical SDVN solution aimed toward improving overall system performance in scenarios where there is a connection loss between the vehicles and the primary SDN controller
HetVNET [18]	Hierarchical	V2V, V2I	- Using HetVNET based on Cloud-RAN architecture, called as SERVICE with a new hierarchical control layer - Flexibility, centralized control, enabling a unified and flexible network
Resource Management in SDVN [19]	Centralized	V2I	- Proposed SDVN solution implements an emulation approach based on the proposed node car architecture in Mininet-WiFi emulation tool - Solution shows applicability and some expected benefits of SDVN in a selected use case scenario
DeVANET [20]	Decentralized	V2V, V2I	- Decentralized SDN-based VANET - Proposed solution exploits SDVN planes by partitioning VANET to work in distributed manner -The proposed architecture is tested on VEINS testbed which provides interactive environment to perform road traffic simulations
dSDiVN [21]	Logically centralized, Physically distributed	V2V	- A distributed multi-hop SDVN-based clustered architecture for infrastructure-less vehicular networks with mobile multi-controllers and a reliable fallback recovery mechanism
Heterogeneous SDVN [22]	Centralized	V2V, V2I	- Under this solution, heterogeneous wireless devices, including vehicles and RSUs, are abstracted as SDVN switches with a unified interface - Advantages of the architecture are adaptive protocol deployment and multiple tenants isolation
Secure SDVN [23]	Hierarchical	V2V, V2I	- The paper provides a tutorial to anticipate secure emerging SDVNs - The requirements for securing SDVNs are identified and presented

Another research category proposes an information-centric approach to optimized service delivery in SDVN and shows that the cohesion of SDVN and named data networking (NDN) can be beneficial in various ways. Vehicular NDN (VNDN) assigns a "name" to the content rather than the device (vehicle), and that name is used to retrieve the required content. There is not enough research papers that deal with VNDN, but research described in [16] propose the use of SDVN and OpenFlow to support customized matching of packet headers for service delivery to end users from content servers. VNDNs evolve new services in the vehicular network, but due the enormous

performance of individual network applications and services in the SDVN framework using novel optimization techniques in wireless and heterogeneous settings. Research initiatives have as their aims increasing SDVN application awareness and optimizing time-critical application services using flow metering, and development of monitoring tools for evaluating performance gains in heterogeneous vehicular network environments.

Table 1 presents an overview of some of the recent solutions in SDN-based vehicular networks.

V. CONCLUSIONS

The emerging SDVN paradigm is imposing new requirements for vehicular network implementation due to the newly deployed infrastructural entities and architectural components. Key components of the framework, the northbound/southbound APIs interfaces and specific controller structure, allow several important new protocols to be used in the SDVN environment. In this paper we described some of the SDVN architecture components, as well as the OpenFlow standard.

We presented current SDVN implementations and examined network services and applications that have been developed based on the SDVN paradigm. Nonetheless, this paper has reviewed the current open research directions and challenges. Most of the SDVN architectures proposed are still in the development stage and require more effort and attention by the research community.

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The Importance of the Partnership Between School And Families

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Abstract - The family is a very important for raising and growing an individual, as well as for the development of a child. Through family, basic human knowledge, experiences, and various interactions with other human beings are acquired. In addition to the family, the child's upbringing can not be imagined without a school. The school is a very old institution and appears in every developed human community, it adapts to the new demands of society and experiences changes based on social demands and its members. The problem of partnership between primary school and family is very complex. It is also very strongly expressed in all social systems. If viewed through history, the family played a very important role in raising and preparing a child for life in the social system regardless of the system in power..

I. INTRODUCTION

Family and school partnerships play an important role in the educational process, and the goal of the partnership of a preschool institution with family is to harmonize educational influences, and it is realized through individual and group contacts. As educational institutions, pre-school institutions should be open to the immediate environment and include all social factors that are interested parties, and primarily family, or children's parents.

The partnership of the family and preschool institutions is very important for achieving the unity of educational influences. Since the child spends most of its life in the family as a member, it lives under the influence of the family. The educational role of the family does not cease even at the time of the child's involvement in pre-school education. Certainly, success in upbringing depends on the co-ordination of family upbringing and upbringing in preschool institutions - the reduction of family education in relation to upbringing in a pre-school institution can interfere with proper child development, progress and successful achievement of socially set goals for upbringing. The goals, tasks of modern preschool education can be consistently achieved solely or only by the coordinated work of families and preschool institutions.

Parenting partnerships and work on the upbringing in a preschool institution should support children's families, otherwise the child will develop into a dual personality because a preschool institution will place one demand in front of a child and the other to the family. Parents should know the goals and tasks, the possibilities of upbringing in preschool institutions.

II. FORMS OF STRENGTHENING THE PARTNERSHIP BETWEEN THE FAMILY AND THE SCHOOL

The launching of the activities of the partnership between the family and the school itself is reflected in their willingness to interact with each other in order to work together towards children. "Every morally mature parent considers child-raising as an integral part of parental care, and it is about responsible parenting. Responsible parenting also includes social foundation, because education is a social phenomenon. "(Tomić, 2006: 20). It is therefore very important that educators inform parents, especially whose children express special preferences, parents whose children show behavior change for unknown reasons, and the like.

Parents also have the need to inform educators of changes that occur in relation to their child. Particularly important information about family circumstances by parents, can usefully serve the educator in creating a treatment for a child, and in particular in compensating for the conditions that are missing in the family of a child. Family occasions often reflect on the child's behavior, which is a signal to the educator to take adequate treatment for the child and to help him, provide him with support and help. Parental information on family behavior also helps to check the accuracy of the child's testimonials, because the child imagines and often mixes fantasy and reality, which creates an unrealistic picture of family circumstances. The mutual exchange of views on

the child between parents and educators is the only way to overcome all the disadvantages that a child may encounter in that period.

Since parents have a partnership on a daily basis with the educators of the school institution their child is attending, the goal of the partnership is the mutual informing of the educators and the parents. Certainly, parents inform educators about the current state of the family, as well as the behavior of the child by coming from school, and especially his leisure behavior as well as the attitude towards the school. On the other hand, educators inform parents about the activity and independence of children in "kindergarten", about the way of acquiring knowledge, skills and habits, and about the most effective forms and methods in order to achieve these activities. Parents introduce educators to the conditions in which a child develops in the family, and the child's abilities and abilities that can be used as a "guide" for the educator to adapt the contents of the educational work to every child.

The partnership between the family and the school is very important and plays a major role through a complete partnership, which relates to the most important aspects of partnership. Types of family and school partnerships are:

- personal contacts with parents,

- Parental meetings: general, class and departmental,

- general pedagogical-psychological education and training. "(Tomić, 2008: 318).

- There are numerous reasons that impose a need for family and school partnerships in the process of raising children. Some of these reasons are:

- Numerous tasks of educating young people can be realized exclusively with the joint engagement of family and school, which imposes the need for their close cooperation in the process of upbringing.

- Coordination of all educational factors is important in the educational work, which points to the necessity of coordination of their activities in order to increase the efficiency and realization of the educational process.

- More and more frequent occurrences of different forms of behavioral disorder require a coordinated action by family and school on their elimination.

Accordingly, parents and teachers, as representatives of the school educators, agree how to meet the needs, interests and opportunities of young people at the time of rapid change, as well as requirements in the interest of the community. They are certainly trying to improve the material conditions of the school, to connect it more with the environment and to make it capable of modern educational work. They jointly take care of the relationship and results that students achieve at school and take corrective and preventive measures in the event of deviations.

Successful partnership between parents and school is the best control of student progress and allows for the taking of adequate measures to eliminate the causes of student failure in school.

"Often the educational influence of the family can be higher than the educational impact of the school. It all depends on whether the family atmosphere is stable, whether there is emotional warmth, mutual trust, love, and other qualities that strengthen the positive effects of the family. "(Tomić, Osmić, Karic, 2006: 87).

It should be emphasized that prerequisites for a successful partnership between the family and the school are necessary, along with numerous factors that depend on this success, which are:

- Determining the adequate place of family in the society, providing assistance and facilitating democratization of their relations.

- The degree of organizing child care, providing opportunities for young people for a comprehensive development and engagement in society through cultural, entertainment and sports life in accordance with regulations.

- It is necessary for parents to provide pedagogical and psychological knowledge through various types of education in order to be more ready in the sphere of rapid social changes to perform successfully their educational role as parents.

- Work on organizing permanent, content, intimate and rich cooperation between parents and teachers with the aim of acting on the effective removal of factors that negatively affect the socialization and humanization of children and young people.

- Through all forms of education (primary, secondary), young people are able to truly understand the function of the family in our society, to notice the importance of family conditions and family education for the comprehensive development of young people.

III. TEACHER AS THE INITIATOR OF FAMILY AND SCHOOL PARTNERSHIP

The teacher is a lecturer in his subject and a teacher for pupils. He is the bearer of the entire educational function, that is, the activities of the school. His teaching function presupposes and requires special education and skills, moral character, attitude towards work and material and spiritual values. Numerous pedagogues emphasized the importance of the teaching function of teachers such as Komensky, Locke, Trstenjak, Binet and others.

There are several interesting attitudes about what a teacher should be:

- we need intelligent and good teachers who will help their students by being kind, gentle and wise, and help them to grow up to be good individuals;

- we need teachers who love their students and see new Bogoslovian personas in them;

- we need teachers who will educate with love and their own example, and see with their heart the true personality of the students. "(Dunđerović, Radovanović, Levi, 2009: 57).

The basic principle is to establish a cordial and friendly contact with students, to be comfortable, to bring in a cheerful mood, cheerfulness, joy, humor. Students need to feel at every place that teachers and educators respect them. The special quality of the teacher's call relates to his creative work with students. Creativity should be a must when it comes to teaching and other forms of educational work at school. That is why the characteristics of the teacher are very important for this line of work. He must be an individual with high moral compass and with the highest character traits. Successful teacher should have the following characteristics:

- possibility of perception-intelligence;

- knowledge of work and creativity-professional knowledge, originality in the production of ideas and practical solutions,

- emotional maturity, honesty and integrity-reliability, trust, openness, readiness to confront conflicts,

- motivation - a high degree of orientation towards achieving good results in teaching ... "(Dunđerović, Radovanović, Levi, 2009. 71).

Nowadays, the function of the school changes, and new roles of teachers as mediators between school and parents are also needed. Of course, changing this function today requires new roles of teachers, and they relate to creative and responsible professionals. The teacher's creativity and responsibility will depend on the extent to which the function of the school will change. Only creative and responsible experts can contribute to changing parents and teachers' partnerships. The very emergence of information technology requires new forms of interaction between students, teachers, parents and school. Naturally, new forms of communication need to be established at school, because teamwork is increasingly required.

The teacher should be able to change the way of thinking in accordance with the current situation, because he needs to be able to help in the development of the institution, the school in which he works. Among the most important roles of a contemporary teacher are:

- the role of education, the teaching of students in order to acquire the knowledge, skills and development ability,

- the role of education for the purpose of adopting or changing values, attitudes and habits,

- developmental role - participation in the process of school development with other experts.

It should be noted that in a traditional school the teacher was a mediator between teaching content, students and parents. Therefore, relations with students were based on hierarchical differences, while the contemporary teacher has to realize numerous tasks such as: new teaching content, new role of students, new teaching strategies, use of diverse sources of knowledge and training of students for permanent education. It should be emphasized that a well-educated teacher can also transfer knowledge to pupils well and be a good educator as well as an intermediary between parents and school.

The teacher should first of all be a good connoisseur of his profession, to have a solid knowledge of pedagogy, psychology, didactics, methodology, sociology and other sciences needed in the process of transferring knowledge in working with pupils and coordinating with parents. Of course, teachers are also required to know the psychophysical characteristics of children of a certain age, to love children and to have a friendly attitude, to have developed interpersonal relationships, to be able to create a favorable pedagogical climate in pupil and parents' collectives, to delight in their work, to always be new, unrepeatable and contemporary. Working on a daily basis with children, the teacher addresses several issues among which these stand out:

- rational organization of acquiring knowledge, skills and habits,

- motivation of pupils for all-day educational activity,

- helping pupils to organize work, rest, play and useful entertainment,

- to know the methods of getting to know and lead a person,

- to know the biological, medical, psychological and pedagogical issues of growth and development of personality, and more.

It should be emphasized that the teacher is the main holder of the application of innovation in the teaching field, which also exhibits in the department with the students with whom he works daily. But in order to be able to apply innovations, he must understand the proposed change and accept it as his own desire, to prepare for it, and to assist it in its realization, to develop its role in the process of application of innovation and to perceive all the effects of change, to introduce independent and new elements and be regularly informed about the intentions and course of change. The New Age, of course, is looking for a new strategy in organizing the teaching process, so the management of this process should be viewed interdisciplinary, taking into account cybernetics, communication theory, new learning theories, didactic doctrine about independent and research work of students and the like.

IV. THE IMPORTANCE OF SCHOOL AND FAMILY PARTNERSHIPS

The school is younger than the family. It is the most consistent expression of the institutionalization of education in very complex societies with an organized division of labor. In the 1980s, a lot was done in the study of socialization at school. School and family are very important factors in the education of young generations, and therefore the overall success in educational work depends on the uniqueness of the influence of these two factors. Certainly their work can increase the positive effect of other educational factors, and the shortcomings in their work can represent a suitable ground for the negative effects of many other educational factors. During the historical development of human society there were contradictory influences of school and family, so the school operated in one, and the family in the other direction. The level of their organization, their pedagogical orientation, mutual help and unique action depend on the development of the individual and the more complete understanding and practical realization of the basic educational goals.

The goals and tasks in our society are unique, and in their realization all educational factors, especially the family and the school, participate. Therefore, the unique educational activity of the family and the school prevents "the disagreement between parents and teachers in the conception of education, the principles of educational work, the means and methods of that work, attitudes towards pupils and their position in teaching and upbringing, the building up of social, moral and characteristic qualities, the training of young people for independent work, the choice of an adequate profession and creative social activity. "(Mandić, 1988). In all areas of education, co-operation between these two factors is necessary, and exclusively for the well-being of children. Responsibility of parents and teachers in the conception of education, principles of educational work, means and methods of this work, attitudes towards pupils and their position in teaching and upbringing, building social, moral and characteristic qualities, training young people for independent work, choice of profession and creative social activity.

Naturally, parents and teachers agree on how to meet the needs, the interests and the opportunities of young people, as well as the demands of the community at the time of rapid change. They try to improve the material conditions of the school, connect it with the related institutions and make it capable for modern educational work. They take care of the attitudes and results that students

achieve at school and take preventive and corrective measures in case of deviation.

There are numerous factors that depend on the success of the partnership between the family and the school, which are:

- "to draw up a solid, realistic and acceptable plan of family and school cooperation, which would be the result of a joint agreement,

- provide material conditions for work with parents (appropriate premises, library for parents, as well as means for continuous maintenance of written contacts),

- stimulating part for teachers working with parents,

- Continuous provision of assistance to the school by educational and pedagogical institutes, local authorities, mass organizations and professional societies in work with parents (interviews, lectures, courses and other forms of work),

- organizing cooperation with parents based on mutual understanding, respect and help,

- at the beginning of the year, carry out a schedule of tasks that the principal of the school will perform with the parents, class teachers, as well as designate one teacher (the best choice is a school pedagogue) who will coordinate the whole work with family members ,

- form a home and school community, work hard to create a work plan and create working conditions for its consistent implementation,

- in agreement with parents, make their general, pedagogical and psychological education, taking into account the possibilities. "(Mandić, 1988).

Once taken into account, the forms of school and family partnership are very important. The school is one of the most suitable institutions that can organize and successfully implement educational work with parents. As the most common forms of partnership that have proven successful in our educational practice are:

- personal contacts with parents,

- Parental meetings: general, class and departmental,

- general pedagogical-psychological education and training.

Personal contacts with parents require appropriate conditions: sincere readiness for parent and teacher partnership, co-ordination of teachers' time in order to maintain liaison, rich pedagogical and psychological education of teachers, material incentives for the work of teachers and the necessary material readiness of the school. "Working with parents requires safety and autonomy in work, dignity and perseverance, justice and humanity, patience and diligence, tact and wisdom" (Mandić, 1988). So parents need to have a sense of co-operation with a teacher, readiness for increased engagement, enthusiasm for self-education, and love for a teacher's call. In addition, they should be patient, persistent and just, humane and tactical, independent and widespread.

In order to establish a lasting and successful relationship with parents and get used to the partnership with the school, the teacher must take into account the following:

- "parents need to be approached naturally, humane, not cold, official, intensified and furnished,

- it is necessary to find a way to show the good aspects of family education and to be concrete about examples of good parental procedures,

- Parents need to be talked to objectively, not to abstract and theorize,

- During the interview, we must show understanding for the parents' difficulties,

- Parents should not only talk about the mistakes and shortcomings of their children, but also their good sides,

- out of the conversation, a genuine teacher's concern for the child and his or her education as a whole should arise,

- the teacher's approach in contact with parents generally has to be such as to create so much mutual understanding and trust, that parents alone in all the difficulties encountered in their upbringing address for advice to the teacher and school, to constantly for the governance and success of their children at school . "(Tomić, 2008. 319).

It can be concluded that the forms of individual contact between parents and teachers are:

- parents visiting school,

- visits to the parental home and

- correspondence between parents and teachers.

General pedagogical-psychological education and parental improvement contributes the general education, and in practice the following types of partnership are being implemented:

- School for parents that helps parents in easier, faster and more successful upbringing of children and youth. The work is mostly conducted according to a program that is in line with needs and occupations.

- Courses and seminars comprise more participants from different categories. They're study issues related to particular subject areas. Courses of pedagogical education and training are organized in order to introduce parents and teachers with their abilities, to adopt them, to use acquired knowledge in practice and to continue to be pedagogically trained.

- Public lectures are popular especially in urban areas. They are discussing current school problems, as well as social problems and child rearing. Some of the topics to discuss can be: delinquent behavior, causes, rehabilitation, child abuse, addiction, consequences, rehabilitation, sexual education of young people and so on.

- Lectures and discussions, which the school occasionally organizes about the current pedagogical problems, important achievements from all scientific fields as well as family education. Discussions can also lead to different problems, family and school cooperation, material problems of the school, help students who are progressing slowly in their classes, help with talented students, negative behaviors among children, and so on.

V.   FAMILY PARTNERSHIP WITH THE PEDAGOGICAL AND PSYCHOLOGICAL SERVICE OF THE SCHOOL

Of great importance is the partnership of the family with the pedagogical-psychological service in school and educational institutions, and for general success in them. Parents should be familiar with general conditions and innovations in education, and this is "a worthwhile effort for complex improvement of the educational process, introducing new elements from the point of view of goals, content, forms and educational

techniques." (Potkonjak, Šimleša, 1989: 286). However, the institution should represent a platform on which parents will exercise their function at the social level. The relationship between school and parents should be partnership, complementary, without pressing or replacing one of them. Institutional pedagogical education should be complementary to parental correctional influences and be associated with them. The fact that children attend a preschool institution should not diminish the responsibility of parents for raising children for the future. In any case, the successful partnership of the family with the pedagogical-psychological service of the school, achieves better results in achieving the goals from preschool and educational programs. Since the immediate educational work with children is shorter and the effects are consistent with it, working with parents has had lasting effects.

In all of this, it is very important that the teachers ability to get parents to the partnership is to gain their trust as a prerequisite for mutual understanding in the education and teaching process. In the pedagogical and psychological sense, parents are the best alies of the teacher in achieving continuity in the child's experience, which is necessary for his learning and development in general. It should be noted that underdeveloped communication between the family and the pedagogical-psychological service of the school is often an obstacle to partnership relations and a complementary relationship between the parents and the educational institution. It should be emphasized that a number of parents are uneducated and therefore insufficiently interested in success of the child in the educational institution.

Democratization in school and relationships in it require teachers to communicate democratically with their students through dialogue, to provide them with support and help in all the problems and difficulties they encounter. The pupil becomes more and more subject of the educational process. In order for teachers to conduct democratization at school, they need the help of a pedagogue or psychologist. Research among respondents of different ages (pupils, students) has shown that there is still undemocratic communication between teachers and pupils.

Today, children grow up earlier, developing great differences between physical and social maturation, young people are exposed to different influences and their development is accompanied

by numerous problems. All this leads to developmental crises, and to forms of behavior that deviate from socially acceptable ones. Such problems can be solved by parents and teachers together with the pedagogical-psychological service.

Young people are exposed to numerous phenomena that aggravate socialization processes, make communication with the environment more difficult, and cause individual conflicts with the environment. These phenomena are: neurotic tendencies, anxiety, phobias, paranoid tendencies, defense mechanisms, posttraumatic stress disorder, and others. In order to help children escape from these conditions, parents and teachers often seek the help of an expert in the pedagogical-psychological service at school.

Addiction (smoking, alcoholism, drug addiction, etc.) is one of the great problems that accompany our time and more and more finds supporters among students of different and increasingly younger chronological ages. In order to prevent these phenomena and to help alleviate and eliminate young people's consequences, they need a wider action and an interdisciplinary approach to a team of experts (doctors, pedagogues, psychologists, sociologists). In solving these problems, the role of the pedagogical-psychological service is essential and necessary.

The role of the pedagogical-psychological service is important in organizing and implementing professional orientation in the school. Pedagogy psychologists know well the socio-economic relations, the world of work, the field of education, the factors and characteristics of personality development, techniques and procedures of professional orientation, then numerous professional disciplines such as: pedagogy, psychology, sociology and others that enable him to successfully solve the problems. "(Mandic, 1986: 76).

To the previous should also be added to consideration the characteristics of our present situation in school and society in general. The consequences of the war, among which are increasingly frequent abuses among children and young people, disadvantaged, incomplete families, the presence of sociopathological phenomena in the family, increasingly requiring need to engage in work with children and youth.

VI. CONCLUSION

Primary school and family partnerships are disturbed by many subjective and objective factors such as poverty and unwillingness of the school to achieve partnership. School is not the only place where knowledge sources are acquired. In addition to the school there are internet, television, film, radio, press, whose contents are very attractive and the way of transfer is different.

When talking about partnership of parents and teachers, then both expect each other to ensure such conditions in school so that each child can achieve its maximum. If there is no permanent partnership between school and family, then there will be some problems difficult for the school to handle, and the consequences will manifest in the pupil's bad behavior, insufficient engagement in work, and hence its success.

The family, school and social environment must be included in the educational process in order to focus young people on responsible behavior in society, encourage their creative abilities, develop an interest in healthy life, develop intellectual work, and contribute to the development of the creativity of society as a whole.

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Preservation and Transfer of Woodcarving Knowledge

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Abstract - **This paper attempts to provide answers to questions like how specialization (i.e. in economy) could be affected by losing the source of knowledge, and how economy of a country could be affected as a result, whether the cause was death or migration of experienced craftsmen. An Agent-based model (ABM) is made to simulate transfer of skills for a woodcarving profession. Based on the agent-based model and simulation this research investigates the effects on the economy of a country once the source of knowledge and expertise is lost.**

Keywords - **Agent-Based model, Craftsmanship, Knowledge transfer, Woodcarving.**

I. INTRODUCTION

From the early history of mankind interpersonal knowledge transfer has been the main source of information and knowledge in general. Woodcarving is one of the earliest crafts humanity has discovered, right next to painting on cave walls. Some crafts still rely on interpersonal knowledge transfer that can be tacit to tacit exemplified in socialization mode, seen as sharing ideas, mental model and technical skills through interaction between organizational members or a focus group [1]. Many woodcarvers acquire their knowledge informally from relatives or through training by another carver [2].

The intention of this paper is to use agent-based models to analyze the conditions and circumstances of woodcarving knowledge transfer. Key aspects that were taken into consideration were demography, duration of apprenticeship, median lifespan etc.

There are no reliable data on the existing number of woodcarvers not only for Bosnia-Herzegovina (BH) but in the region [3]. The Mesa model is based on statistical data from Konjic municipality [4] as this area has the largest number of woodcarving shops in BH and Konjic woodcarving, as an artistic craft, is listed on the UNESCO Representative List of Intangible Cultural Heritage of Humanity. The craft is widespread among Konjic inhabitants, both as an occupation and as a hobby, and while the main bearers are trained craftspeople who work in woodcarving workshops, bearers who practise the craft at home are equally important. The owners of family-run woodcarving workshops are most responsible for safeguarding the element, training apprentice woodcarvers and popularizing the craft. Knowledge and skills are transmitted primarily through on-the-job training of novices in the practising workshops, as well as through intergenerational transmission within the family [5].

II. MODEL DESCRIPTION

A. Model setup

Social scientists have been exploring the factors that contribute to the human social behavior over a period of time and where it has lead them in this field for employing ABM to investigate this social phenomena [6]. Agent-based modeling involves simulating the behavior and interaction of many autonous entities, or agents, over time [7]. The purpose of the model is to compare several knowledge transfer scenarios and to identify the ratio of the population required to maintain the woodcarving knowledge for future generations.

The model is based on the Mesa ABM framework in Python. The benefits of Agent-Based Modeling (ABM) over other modeling techniques can be captured in three statements: (i) ABM captures emergent phenomena; (ii) ABM provides a natural description of the system; (iii) ABM is flexible [8].

Four types of agents are used in the model: general population, apprentice, master and mentor. The apprentice is selected from the general population based on several parameters (age, affinity and number of students the mentor accepts per year). A master is an agent that has completed his training but does not have sufficient knowledge

to start teaching. Mentor is an agent with at least 20 years of experience. Mentor agents can transfer knowledge to students. All other agents, the majority, are general population.

Every agent has four attributes: Age, Knowledge & Experience, Affinity to learn, Ability to teach.

Konjic municipality statistical data used for the model (based on the latest census from 2013):

- Konjic population: 25148
- Labourforce: 17446 (69.4% of population)
- Employed: 5358 (21.3% of population; 30.7% of laborforce)
- Average lifespan: 73.4

There are 2 major woodcarving shops (families Mulić and Nikšić) and about 10 small woodcarving shops in Konjic.

B. Outputs of the model

The model operates with a given number of mentors (woodcarvers with at least 20 years of experience), apprentices (agents starting the training), a given average lifetime and minimum affinity/ability to accept knowledge. The initial number of inhabitants is based on statistical data for Konjic. The number of mentors should be maintained during time to ensure the knowledge is secured for future generations.

C. Model interface

The model inputs are (Figure 1):

- Slider for setting the disaster frequency (from 0 to every 100 years)
- Slider for setting the initial number of mentor agents (between 1 and 15)
- Slider for setting the initial number of master agents (between 0 and 50)
- Slider for setting the initial number of apprentice agents (between 5 and 1000)
- Slider for setting the number of apprentices per mentor (number between 1 and 20)
- Slider for setting the step time in months (between 3 and 12)
- Slider for setting the average lifetime of an agent (between 50 and 100)
- Slider for setting the number of frames per second (between 0 and 20)
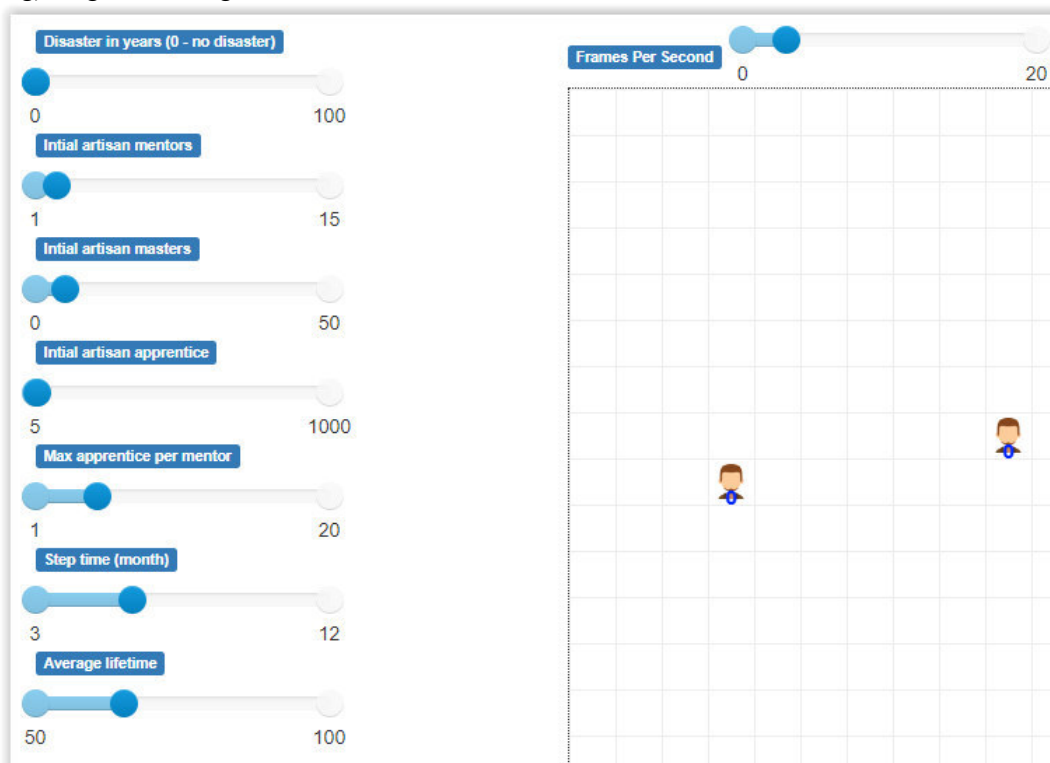
Figure 1. Model interface

The disaster slider when set to a value greater than 0 simulates any kind of disaster that could influence the preservation of woodcarving knowledge. These disasters could be (but are not limited to):

- Migrations
- Loss of affinity/interest for woodcarving

- Natural catastrophes resulting in a decrease of population hence woodcarvers

There is a grid (Figure 3) for visual representation of the model and a chart (Figure 2) showing the number of each agent (mentor, student/apprentice and master) through time. A critical period is where the number of mentors and masters of the craft becomes low (close to zero). The model examines under which conditions (model setups) the critical periods occur.
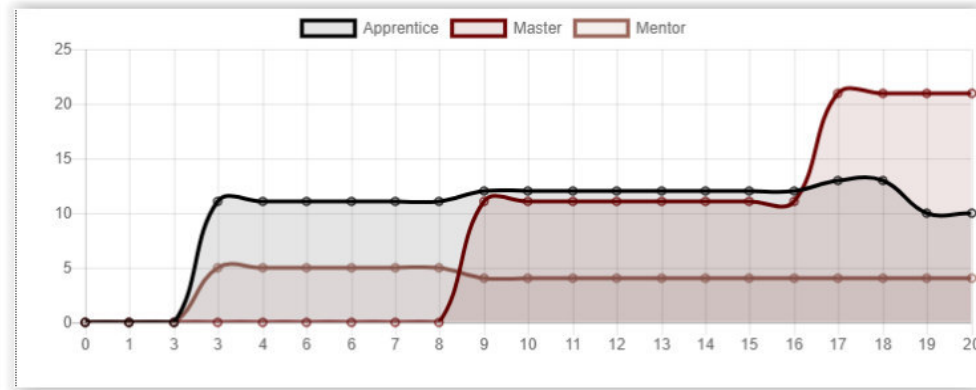
Figure 2. Chart showing number of agents after 20 years
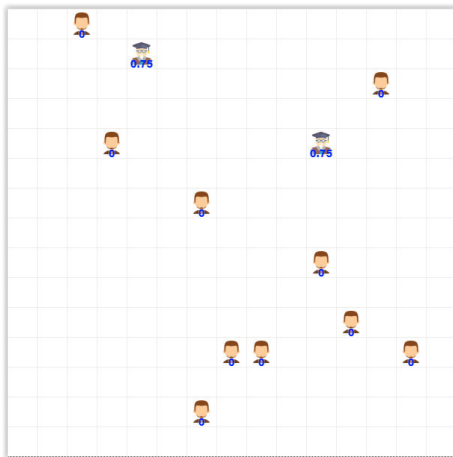
Figure 3. Grid with agents

Transferred knowledge is a function of mentor's skills, his ability to teach, student's existing knowledge and his affinity to learn. Knowledge transfer is calculated using the following formula:

$$Z_t = (Z_m - Z_{t-1})*M*L/t$$

Where:

Z_t – New state of student's knowledge
Z_m – Mentors knowledge
Z_{t-1} – Previous state of student's knowledge
M – Mentor's ability to teach
L – Student's affinity for the craft (ability to learn)

t – Selected step time

III. EXPERIMENT

The experiment was conducted by running the model with various settings. Three scenarios are presented:

- pesimistic
- optimistic
- realistic

The pesimistic uses the worst-case settings while the optimistic is run using highly unrealistic settings. The realistic scenario uses statistical data as for settings and offers a more near-life insight in the possible knowledge preservation.

A. Pesimistic scenario

The pesimistic scenario uses the worst-case settings:

- Disaster occurs every 20 years
- There is only one mentor
- Interest is low (only 5 students)
- Mentor can teach only 1 student per cycle
- Average lifespan of an agent is 50 years

The results show (figure 4) that after only 24 years the knowledge is lost i.e. there are no mentors to transfer the knowledge. What the results are showing over time is the periodic emergence of self-taught masters of the craft but their numbers are insufficient to re-create a knowledge transfer system.

Figure 4. Pesimistic scenario 1

With the lifespan set to a more realistic average of 73.4 years the results are much better (figure 5). The number of agents is maintained due to the extended lifetime. Masters are responsible for the preservation of the knowledge because there is always a sufficient number of agents to produce new mentors and new apprentices. Thus the knowledge transfer is persistent even with such a pesimistic scenario with very low numbers of mentors and apprentices.
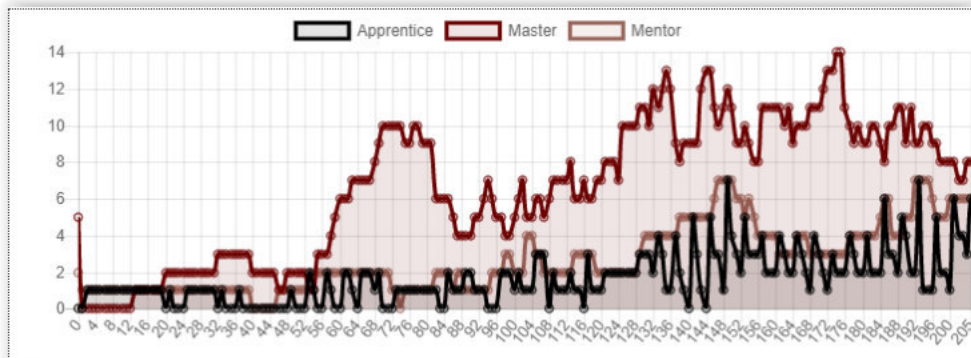
Figure 5. Pesimistic scenario 2

B. Optimistic scenario

For the optimistic scenario all settings were set to an optimum:

- Disaster occurs never or every 100 years
- There are 15 mentors
- Interest is very high
- Mentors can teach 20 students per cycle
- Average lifespan of an agent is 100 years

The results show that after only 50 years there is large number of agents (mentors, masters and students) and interest is still very high so the knowledge preservation is secure (figure 6).
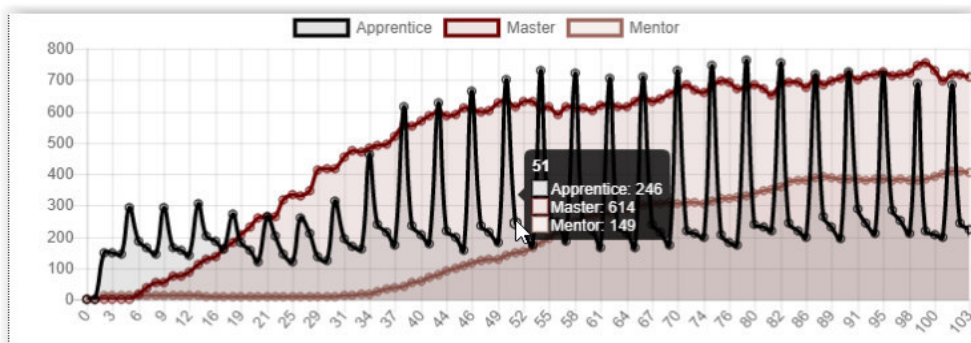
Figure 6. Optimistic scenario after 50 years

After a 100 years (figure 7) the interest is still high as well as the number of agents. Preservation of knowledge is maintained and not in danger.
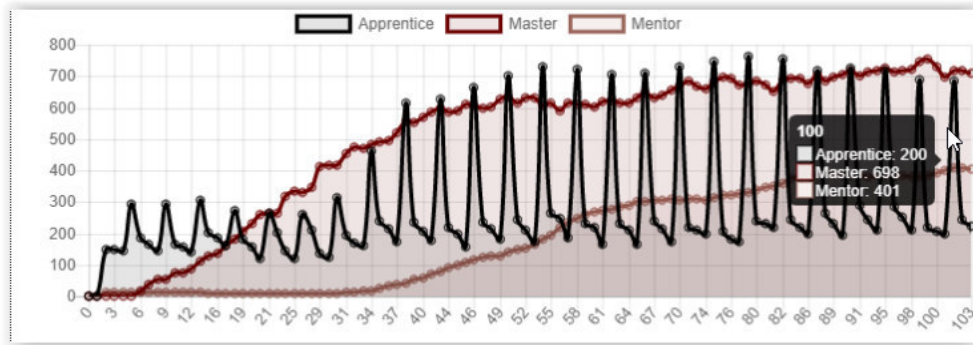
Figure 7. Optimistic scenario after 100 years, no disaster

If a disaster that occurs every 100 years is introduced into the optimistic scenario the model returns a somewhat similar result (figure 8).
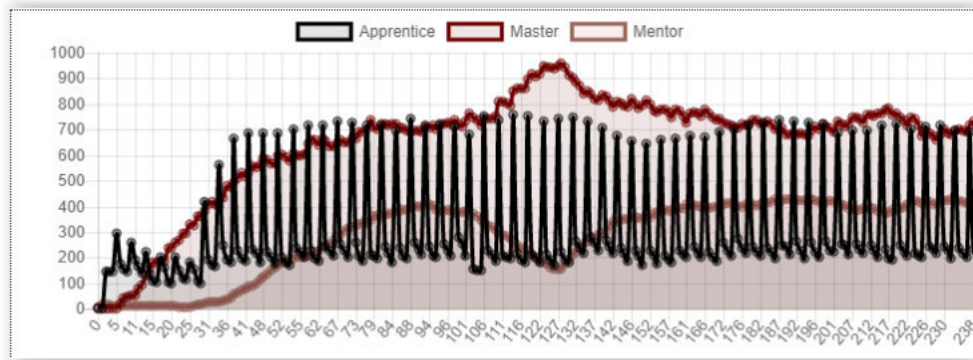
Figure 8. Optimistic scenario with a disaster every 100 years

The model shows that soon after the first disaster occurs the number of mentors starts to decrease but due to a large number of masters and apprentices this has very little impact on the preservation of knowledge.

C. Realistic scenario

As mentioned earlier, the realistic scenario uses statistical data for initial settings of the model:

- Disaster occurs never or every 20 or 40 years (these settings were changed to see how the model responds)
- There are up to 10 mentors
- Interest is low
- Mentors can teach 3 to 5 students per cycle
- Average lifespan of an agent is 73.4 years

The model was first run without a disaster occurence. The results show that after a 100 years the number of agents is sufficient to maintain the knowledge transfer to new generations (figure 9).
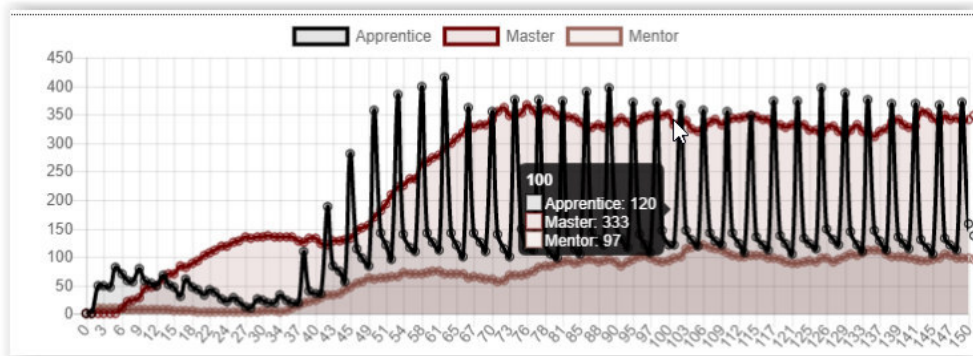
Figure 9. 10 mentors teaching 5 students, no disaster

Running the model, but this time having 5 mentors teaching 10 students per cycle without a disaster occurring during the model's timeframe, gave similar results (figure 10).

Knowledge is preserved and transferred to new apprentices in the future.
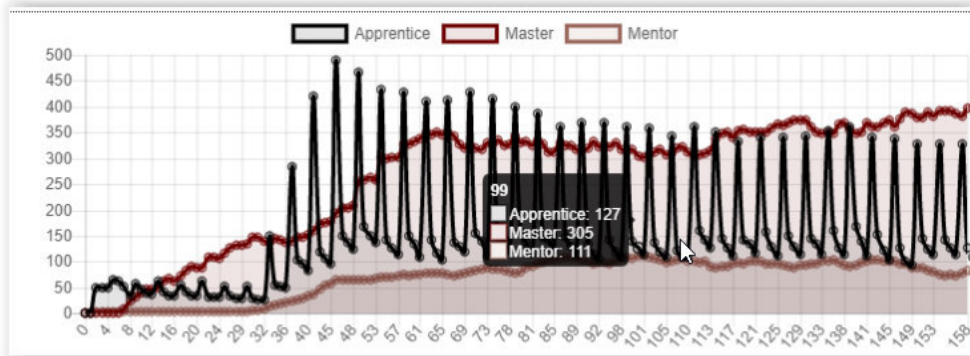
Figure 10. 5 mentors teaching 10 students, no disaster

Introducing a disaster every 20 years (figure 11) in the same scenario shows that the knowledge

is still preserved and there are sufficient critical agents to uphold it.
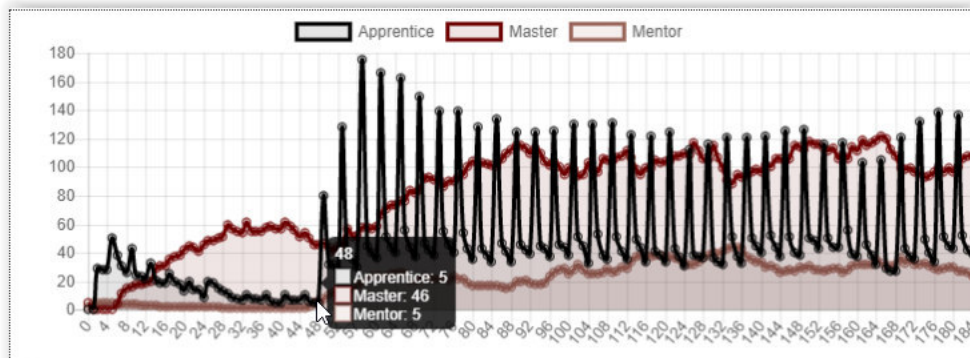
Figure 11. 5 mentors teaching 10 students, disaster every 20 years

Reducing the number of mentors and apprentices gives a similar result i.e. critical actors in the process of knowledge preservation and

transfer are preserved and knowledge is transferred (figure 12).
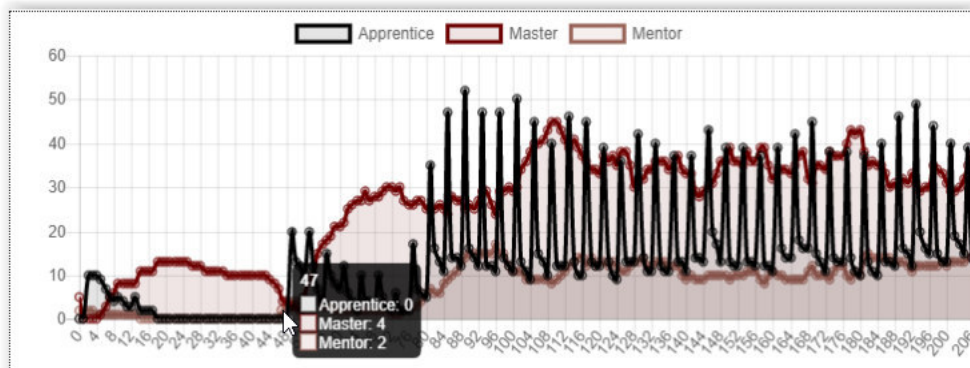
Figure 12. 2 mentors teaching 5 students, disaster every 20 years

Changing the disaster frequency from 20 to 40 years and running the model as before gives the

same results (figure 13).
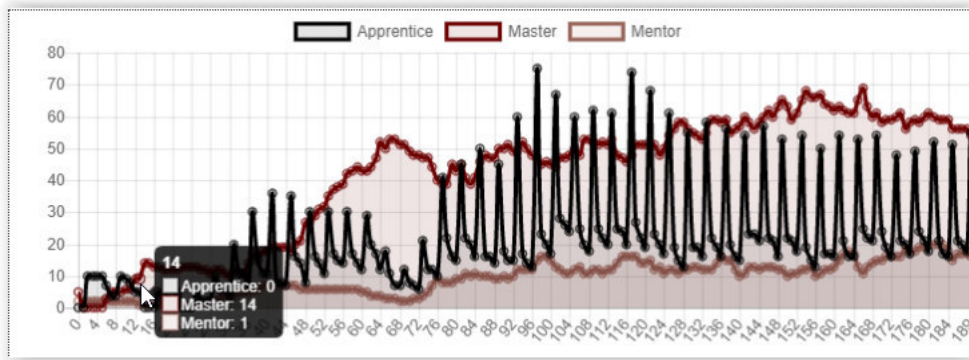
Figure 13. 2 mentors teaching 5 students, disaster every 40 years

Decreasing the number of mentors and apprentices in the model produces a somewhat critical situation in the beginning but very soon the number of agents critical for knowledge transfer increases (figure 14).
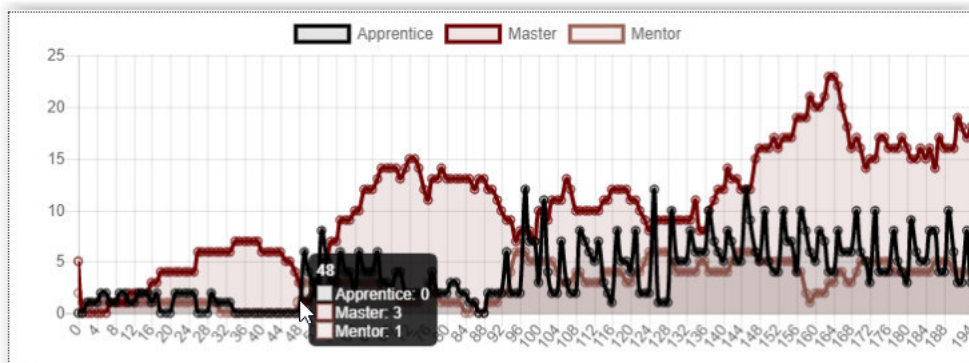
Figure 14. 1 mentor teaching 2 students, disaster every 20 years

Extending the lifespan from the average of 73.4 to 80 years only improves te future for preserevation of knowledge (figure 15).
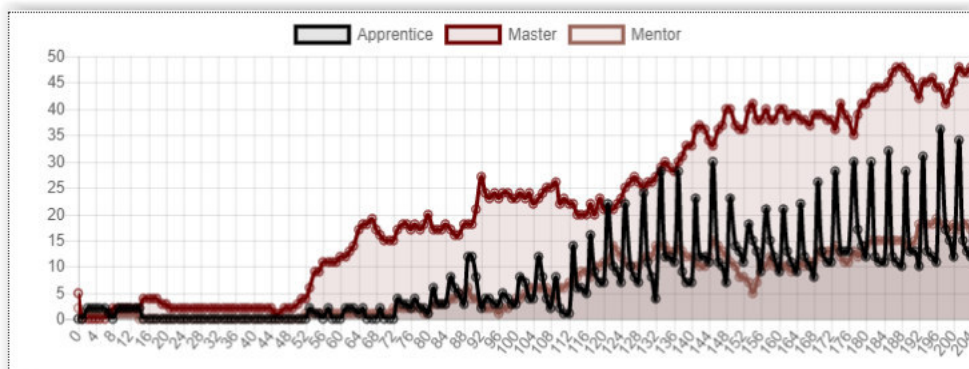
Figure 15. 1 mentor teaching 2 students, disaster every 20 years, lifespan 80 years

IV. CONCLUSION

Although the mentor is critical to transfer knowledge to the apprentice, the model shows that without a systematic preservation of master agents the preservation and transfer of knowledge is not possible. Every disaster scenario showed that after a certain period of time agents (mentors and apprentices) disappear or their numbers decrease to a critical low but knowledge is preserved thanks to a critical number of master agents that is maintained.

Even with a low interest for woodcarving and a small number of mentors (3) and apprentices (5 per cycle), knowledge could be preserved if there are enough master agents. Although after a while

the model has no mentors or apprentices (figure 16), over time the master agents are promoted to

mentors and the teaching cycle is re-established (figure 17).
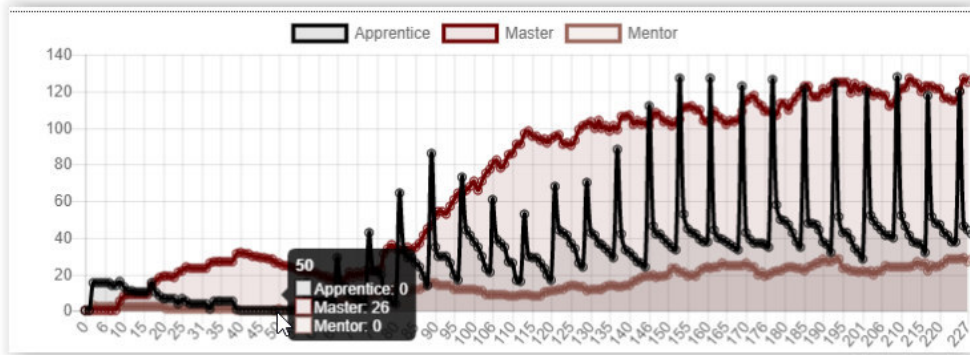
Figure 16. Importance of master agents

With all the mentors and apprentices gone, the masters were a sufficient force to re-start the learning process as some gained experience and

knowledge to become mentors who would then teach new apprentices.
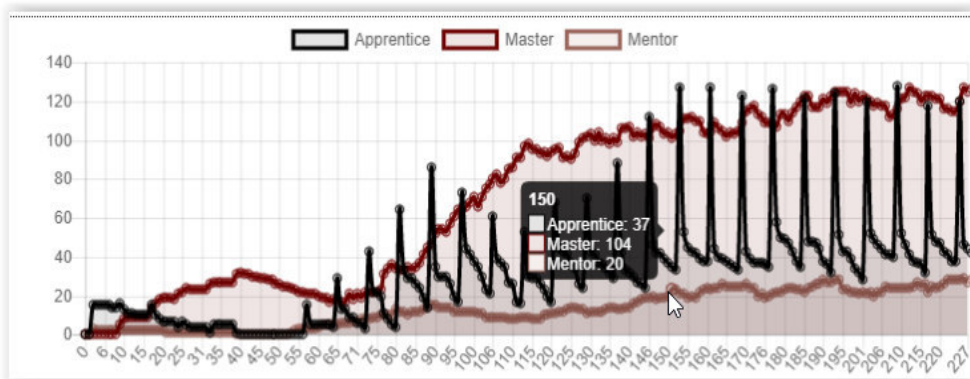
Figure 17. Teaching cycle re-established

This model could be used to identify potential threats and help mitigate (or avoid) them in order to preserve woodcarving knowledge and maintain knowledge transfer for future generations. Not having masters at the start of the model could be seen as a limitation but it was used to confirm the importance of this agent for the overall preservation of woodcarving knowledge and knowledge transfer in general.

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Decision Making Using Sequential Equation Modelling Applied for Pellet Production

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Abstract - By means of learning experiences, students are expected to know, understand, and be able to demonstrate certain skills, behaviors, and attitudes. These learning experiences have been defined and described by several different learning theories. The 21th century the most common learning theories have been behavioral and cognitive learning theories. Behavioral learning theorists explain learning as relatively permanent change in "hierarchical, observable, and measurable behaviors" whereas cognitive learning theorists explain learning "as an internal change in mental associations". The pellet production (PP) has the potential to improve the social, economic and environmental elements of the local community, as well as to expand the development of state economy growth. Work study examines community support for that development in the context of sustainable development. This topic is interesting for processing because it deals with specific and so far in Macedonia untreated problems and aspects arising from the relationship between the local community and the state efforts for better conditions for development and higher standard.
Key words: SEM, attitude, pellet production, sustainable development

I. INTRODUCTION

Pellet production (PP) or financial funds are constantly faced with the discontinuance of resource exploitation, which eventually leads to comprehensive social change and economic crisis. The possibility of providing development by means of foreign capitals for facilities and industrial plants become ruins leading to the decisive rejection in symbolic and material terms, but the area and its population look for other symbols and alternative economic activities. Therefore, it is necessary to provide viable alternatives that could be compared to the benefits generated faster development and better standard.

The industry heritage in the broader context of studying the development of dealing activities, buildings and landscapes that come from earlier periods of intensive industrialization. The local economy is part of a broader category, which deals with the history of settlements. The sense of pride and wonder of the engineering achievements of the industrial revolution, creates a special feeling with economics which is especially important in educational terms. Sustainable development in the context of the development of economy and new technologies as an activity does not call into question the long-term economic feasibility of extraction of resources, but focuses on the protection of the negative social and environmental consequences.

The aim of this paper is to examine the extent to which the local population agrees with the sentence and determine whether their perception of various aspects of sustainability affects support overall sustainability of the economy and industrial development.

A. Social, environmental and economic sustainability

In the social context of economy is associated with an uncompromising exploitation of workers and the hard life of their families according to the post communism period. For the development of the industry and economy it is important to provide support and political factors, which should feel like a part of the project and to ensure the political and economic certainty of its further development. In this process, it is essential that local people participate in the decision-making process with the ability to selflessly share their experience, skills and knowledge. Many companies have interests that are accountable to local people and become aware of the need to reduce conflict with key stakeholders. Limited regeneration of the natural environment is achieved publicity about the wider social engagement, promoting space that is radically changed as a result of human activities,

and today again contains a visually attractive landscape that are completely contrast.

Economy with pellet production (PP),, different industry and different advanced technologies provided higher employment, providing an alternative to living on welfare. The development of industry leads to the creation of a new image of local towns, villages, but the places in which it can achieve a higher quality of life, higher employment and active protection of natural and cultural values in service all kinds of development.

Since the development of communities must be based on diversification of the economy based on the development of economy projects to promote domestic industry. Local community planning and use tourism as an alternative means of stimulating economic development needs to develop sustainable tourism which can meet the needs and demands of its citizens.

B. Methodology and research results - Data collection and sample

The research was conducted in order to identify key aspects of sustainability of the pellet production (PP) is perceived by locals. The questionnaire/survey includes statements that measure aspects of sustainability of the pellet production (PP) social, economic and environmental sustainability. The research model (Figure 1) that was used for the realization of empirical research includes four variables: social sustainability, economic viability and environmental sustainability and support for sustainable pellet production (PP) and development of the economy and industry heritage. The independent variables are social, economic and environmental sustainability, and the dependent variable is to support sustainable development.

The research was conducted on a sample of 600 respondents who makes the local population of the pellet production (PP) of Stip and Kavadarci, The Republic of Macedonia. When formulating a sampling strategy, was taken into account that the sample covers approximately equal number of men and women in the mentioned towns, with different education and different occupations, and that includes individuals of different age groups ranging from 18 to 60 years.

The structure of the sample makes 45.0% of male respondents and 55.0% of female respondents. The largest proportion of respondents in the age group of 21-25 years (35.0%), and

respondents between 36-45 years (25.0%) and respondents between 26-35 (25%). The least numerous are those in the age group 46-50 years (7.0%), and less 20 years (4.0%) and over 60 (4.0%). If we analyze the level of education, 40.0% of respondents had completed high school, 30.0% have a college degree, and 30.0% of examinees had education at the primary level. When it comes to employment, the sample includes 55% of employees and 45% of the unemployed. Regarding marital status, 55.0% were married / married, and 45.0% were unmarried / unmarried. The sample mainly consists of respondents in various ways involved in pellet production (PP) as an activity (15%), while respondents who were not involved in pellet production (PP) accounted for 85%.
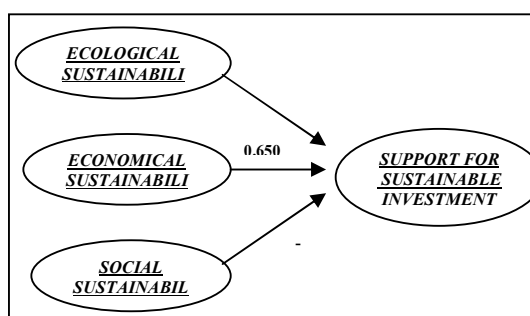
Figure 1. Research model
Notes for model: p < 0.05 (**), ns – not significant

TABLE I. DEMOGRAPHIC STRUCTURE OF THE SAMPLE (N = 150)

	Number of sample (%)
Male	65 (45,0%)
Female	75 (55,0%)
Age	
<20	6 (4,0%)
21-25	53 (35,0%)
26-35	37 (25,0%)
36-45	37 (25,0%)
46-60	10 (7,0%)
>60	7 (4,0%)
Education	
Elementary school	30 (20,0%)
High school	60 (40,0%)
College	15 (10,0%)
Faculty	45 (30,0%)
Marital status	
Married/Married	65(55,0%)
Not married/Unmarried	75 (45,0%)
Employment	
Employed	75 (55,0%)
Unemployed	65 (45,0%)
Involment in PP	
On	20 (15,0%)
Off	130 (85,0%)

To create a clear and concise questionnaire, organized focus groups (different towns - each one with 75 respondents). For ease of use of the questionnaire/survey consisted of a printed page. After making questions, the survey pre-tested on a small sample of 20 randomly selected respondents. The results of this pilot survey we found that the

allegations in the questionnaire clear and easy to understand and there was no need for any additional changes. Respondents who agreed to participate in the study provided sufficient time to consider their responses. It was agreed that interviewers contact respondents and collect questionnaires after three days. Of the 150 respondents, 150 of them returned the completed questionnaire interviewers. Subsequently, questionnaires were tested, and 10 of them were excluded from further analysis due to the fact that they are not adequately filled.

C. Measures

Claims are chosen reviewing relevant literature. Social sustainability is measured by six statements which were selected based on the study of Chen and Chen (2010), Dyer et. al., (2007), Kuvan and Akan (2005), Vargas-Sánchez, et. al., (2009)., Oviedo-Garcia et. al, (2008) and Choi and Sirakaya (2005). Economic viability is measured by two statements which were selected on the basis of studies, Chen and Chen (2010), Vargas-Sánchez, et. al., (2009), Kuvan and Akan (2005), Dyer et. al., (2007), Oviedo-Garcia et. al, (2008) and Choi and Sirakaya (2005). Four arguments are used for ecological sustainability and designed on the basis of allegations that use Kuvan and Akan (2005) and Choi and Sirakaya (2005). Support sustainable DFI of the economy heritage which is measured via two assertions on studies Lee (2013) and Dyer et. al., (2007). All claims are additionally adjusted for the purposes of this study. The research model is shown in Figure 1. All statements were measured by Likert scale of five points (1-I fully agree, 5-I completely agree).

D. Data analysis

Data analysis was performed through the Statistical Package for Social Sciences (version 12.0) and the AMOS (version 18.0). The following statistical analyzes: correlation analysis, confirmative factor (CFA) and structural equation modeling (SEM).

Cronbach's alpha

Cronbach's alpha is a measure of internal consistency, that is, how closely related a set of items re as a group. It is considered to be a measure of scale reliability. A "high" value for alpha does not imply that the measure is unidimensional. If, in addition to measuring internal consistency, you wish to provide evidence that the scale in question is unidimensional,

additional analyses can be performed. Exploratory factor analysis is one method of checking dimensionality. Technically speaking, Cronbach's alpha is not a statistical test – it is a coefficient of reliability (or consistency). Cronbach's alpha can be written as a function of the number of test items and the average inter-correlation among the items. Below, for conceptual purposes, we show the formula for the standardized Cronbach's alpha:

$$\alpha = \frac{N \cdot \bar{c}}{\bar{v} + (N-1) \cdot \bar{c}} \tag{1}$$

Here N is equal to the number of items, c-bar is the average inter-item covariance among the items and v-bar equals the average variance. One can see from this formula that if you increase the number of items, you increase Cronbach's alpha. Additionally, if the average inter-item correlation is low, alpha will be low. As the average inter-item correlation increases, Cronbach's alpha increases as well (holding the number of items constant).

E. Results

In the first step, based on the value of the coefficient Cronbach's alpha was estimated reliability and internal consistency of the statements through which the measured latent variable models (Table 1). All variables have an adequate level of reliability, as the coefficient of Cronbach's alpha over the required threshold is 0.6. The results show that the highest degree of reliability is reflected in variables Environmental sustainability (Cronbach's alpha = 0.896), whereas in the case of variable support sustainable DFI present a slightly lower level of internal consistency of the statements which have been used for its measurement (Cronbach's alpha = 0.615). The condition of convergent validity was met by the fact that the AVE of all constructions was greater than the minimal threshold of 0.5. Through comparison of AVE and squared correlations between constructs, discriminant validity was also analyzed. Given that the value of AVE for each individual construct is greater than the squared correlations between the given construct and other constructs, discriminatory validity was assured for model variables. Composite reliabilities (CR) of all variables were 40.8 suggested that composite reliability should be great than 0.6.

In order to test the influence of the independent variable on the dependent model, we used SEM (**structural equation modeling**). We looked at the

impacts of social, environmental and economic sustainability in support of sustainable development. In this case, the only variable is the economic viability showed a statistically significant effect on the support that the local population has when it comes to sustainable **PP** development of the **PP** heritage ($\beta = 0.647$, p> 0.05). The other two variables do not show a statistically significant effect on the local population support the sustainable development of DFI. The above research findings clearly indicate that the local population believes that the economic benefits of DFI development provide their full support for the sustainable development of the PP heritage, especially if **took** into account that the municipalities **(above mentioned towns)** one of underdeveloped in **Macedon**ia.

TABLE II. CONSTRUCT INTER-CORRELATION MATRIX, AVE, CR AND CRONBACH'S ALPHA

	Economical sustainability	Environmental sustainability	Social sustainability	Support for PP sustainability development
Economical sustainability	1.00			
Environmental sustainability	0.50***	1.00		
Social sustainability	0.75***	0.65***	1.00	
Support for PP sustainability development	0.65***	0.20***	0.45**	1.00
AVE	0.75	0.70	0.50	0.50
CR	0.85	0.85	0.85	0.70
Cronbach's alpha	0.85	0.90	0.85	0.60

TABLE III. FIT INDICES

Fit indices	X²/df	CFI	TLI	IFI	RMSEA
Recommended values	< 3	> 0.90	> 0.90	> 0.90	< 0.1
Model values	1.75	0.95	0.95	0.95	0.08

TABLE IV. RESULTS OF SEM ANALYSIS

Parameter	B	p
Social sustainability → Support for PP sustainability development	-0.041[ns]	0.85
Environmental sustainability→Support for PP sustainability development	-0.041[ns]	0.75
Economical sustainability → Support for PP sustainability development	0.650**	0.01

**Correlation is significant at the 0.05 level*

II. CONCLUSION

By encouraging a lifestyle that is characteristic of the **industrial and economical** community will keep a written record of their existence and attributes that otherwise may have disappeared. One of the ways that **industrial and economical** communities benefit from their **PP** heritage, and also by the protection and the development of **economy.** Achieving sustainability is possible if the local **industrial and economical** community is

involved in the formation of the image of **the local places**, because only in this way can ensure the authenticity of the **PP** heritage. Given the specific and unique challenges of development of the **PP** heritage, it is recommended to cooperation at national and international level in order to identify good practices and utilize their experience to achieve sustainability.

The research provides a significant contribution to the existing literature by highlighting the links between various aspects of sustainability and support the sustainable development of **PP** heritage in the specific environment of the local **industrial and economical** community. Similar studies were implemented in a very small number of studies in the field of **industry and economy**, so in that sense, the proposed research model has a certain amount of innovation, primarily because of its specific composition. The resulting research findings confirm that there is a significant correlation between perceptions of economic sustainability and support the sustainable development, primarily as a result of the high expectations of the potential benefits when it comes to the future economic development of local communities that could potentially arise from the development of the industry **and economy**.

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Euler's Number and Calculation of Compound Interest

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Abstract - In this paper we shall explain the connection between Euler's number and the calculation of compound interest with emphasize on the power of compound interest. The beauty of compound interest is that allows you to earn interest on your interest so that while you have to sweat to earn money you initially invest, from than your money works on your behalf i.e. the money earned, earns money. Therefore, the financiers around the world, describe compound interest like the most powerful force in the universe. From above mentioned statements and affirmations understanding and detailed study of compound interest represent a very important field in financial mathematics which must be known not only by financiers, bankers and economists but is equally important to be known by each individual or person. Because earning money is not just and art, but also agility, know-how, branch of knowledge and science in main percentage.

I. INTRODUCTION

Everyone met constant e during the high school years as the basis of natural logarithm, natural exponential function, in mathematical analysis – solving derivatives and as part in other mathematical equations and formulas. Euler's number belong in the top five most "beautiful" numbers in mathematics alongside 0, 1, i - the imaginary unit and π. All five of these numbers appearing in the formulation of Euler's identity.

In 1618, John Napier used the constant and calculated a list of logarithms, but the above mentioned list doesn't content the constant e itself. e=2, 7182818284590452353360287471352…

This number express the natural exponential growth as in the figure 1.
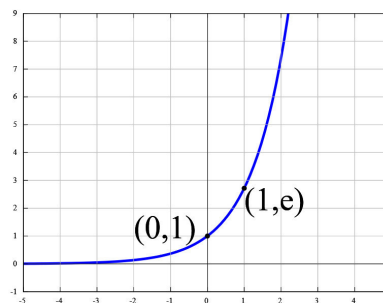
Figure 1. Natural exponential function e^x

The number is called Euler's number after the Swiss mathematician Leonhard Euler, although credited to discover the constant itself is Jacob Bernoulli.

Bernoulli, in 1683, has discovered and calculated the value of the number e analyzing a question about compound interest.

This constant is denoted by the letter e and has a lot of applications and utilizations in many scientific fields as mathematics, physics, biology and others. Number e takes the main place in describing logarithmic spiral which often appear in nature. For example, the storks start their flight perfectly describing the logarithmic spiral. The "eyes" of the peacock's tail are arranged in the same spiral, which never end.

From the logarithmic spiral we come to another application, the gold section, which is obtained by the proportion of the distances between two arcs of the logarithmic spiral. It is also find everywhere, from snail shells and human body proportions to Johan Sebastian Bach's fugues in the musical compositions The Art of Fugue and some musical works from The Beatles.

The conclusion from the mentioned examples it's that number e represent one of the most famous numbers in different science branches; with a lot of utilizations.

II.   NUMBER *E* UNDER READING GLASS

The number's *e* multitude of applications and its importance in science does not allow us to not hold on its definition and detailed description.

The Euler's number represents a mathematical constant with value:

Also, the base *e* of the natural logarithm is the inverse function to the natural exponential function.

Euler's number is often met in several mathematical domains. Just like π, the number has similar properties as follows:

- It is a positive number;
- It is a real number;
- It is a irrational number;
- Transcendental number;
- Infinite number.

The function

$$f(x)=e^x \tag{1}$$

called natural exponential function, is the unique exponential function of type a^x equal to its one derivatives.

Euler's constant can, also, be defined as limit value of the series of numbers

$$e = \lim_{n\to\infty} \left(1+\frac{1}{n}\right)^n \tag{2}$$

Of course, there is still a lot to write about constant *e* and its various applications in mathematics and into other scientific branches, but from here, we'll focus on the connection between Euler's number and calculation of compound interest.

III.   BERNOULLI'S TRIAL ABOUT COMPOUND INTEREST

Jacob Bernoulli (1654 – 1705), born in Basel, Switzerland was an eminent mathematician with remarkable achievement in several mathematic branches.

In 1683, he has calculated the value of number *e* during studying the compound interest. Bernoulli has formulated the problem in the following way:

If 1,00 monetary unit is invested in an ideal bank which will pay 100% annual interest, and if the interest is credited once, at the end of the year, the value of the account at year-end will be 2,00 monetary units.

Let's suppose that the bank will calculate and add interest every six months; in that case it will offer an interest rate of 50%, so the initial 1 monetary unit is multiplaid 1,5 twice. After one year, the account value will be 2, 25 times bigger that the initial deposit.

$$1.00 \times (1.5)^2 = 2.25 \text{ monetary units}$$

Continuing with the same logic for quarterly interest rate of 25% i.e. compounding interest add four times per year, will be obtained:

$$1.00 \times (1.25)^4 = 2.4414 \text{ monetary units}$$

With monthly compounding the bank will offer interest rate:
$$(1/12 \times 100\% = 8.3\%)$$

In this case, the amount will increase as follows:
$$1.00 \times (1 + 1/12^{12}) = 2.613035 \text{ monetary units}$$

For weekly compounding, the bank will offer interest rate of 1, 9 %:

$$1/52 \times 100\% = 1.9\%;$$

the initial amount will increase to 2,69 monetary units.

For compounding daily yields, the bank will offer interest rate of 0, 2% i.e.:

$$(1/365 \times 100\% = 0.2739\%);$$

the amount will increase to 2,7145 monetary units. If there are n compounding intervals; than the interest rate will be the reciprocal value or 1/n.
If we formulate an equality for the above calculations the value on the end of the year will be:
$$(1 + 1/n)^n.$$
What will happen if n grows infinitely?
This is the question which Bernoulli was trying to answer, but it took fifty years for Euler to come along and solve it, using the following equation:

$$e = \lim_{n\to\infty} \left(1+\frac{1}{n}\right)^n \tag{3}$$

It turns out the answer is the irrational number *e,* which is about 2, 71828…
Generally speaking, an investment that begins with 1,00 monetary unit and a bank offer an annual interest rate R; after t years will receive a profit of e^{Rt} monetary units with continuous compounding. Where

R represents the equivalent of the interest rate expressed as a decimal number.
For example:
R = 1/100 = 0,1

for 10% interest rate.
If we note the initial deposit with S_0 and this is invested for a period at *t*-years, with interest rate R, and if the calculation is continuously; in that case the final amount of money, noted S will be :

$$S = S_0 \times e^{Rt} \qquad (4)$$

The components of formula (4) are:
S - is total amount ,
S_0- is the initial investment i. e. initial deposit,
e - represent Euler's number,
R - interest rate,
t - compounding time, periods.
In the table below we'll find the calculations of continuously compound interest from which we can conclude that Euler's number was calculated precisely with this reasoning.

TABLE 1. CALCULATION OF CONTINUOUSLY COMPOUND INTEREST

Calculation period	Number of periods	Compound interest
Annual	1 year	$\left(1 + \frac{1}{1}\right)^1 = 2$
Monthly	12 month	$\left(1 + \frac{1}{12}\right)^{12} = 2,6130\ldots$
Daily	360 days	$\left(1 + \frac{1}{360}\right)^{360} = 2,7145\ldots$
Per hour	8.640 hours	$\left(1 + \frac{1}{8.640}\right)^{8.640} = 2,71812\ldots$
Per minute	518.400 minutes	$\left(1 + \frac{1}{518.400}\right)^{518.400} = 2,71827\ldots$

IV. THE THEORY OF COMPOUND INTEREST

History's most famous scientist is said to have once described compound interest as "the eighth wonder of the world".
"He who understand it, earns it; he who doesn't pais it", Albert Einstein reportedly said.
Interest represents the amount of money that is received for a bank deposit or paid regularly by the borrower in obtaining a bank loan.
In the present time, banking is well developed and today banks offer a wide range of products and services.
Today , banks use a few types of interest such as :
- Simple interest,

- Compound interest,
- Nominal interest,
- Real interest.

Compound interest is different because the interest is integrate into initial deposit. The financiers called this process capitalization of interest i.e.it is said that interest is calculated on interest.
We need to mention the difference between simple and compound interest for receiving a complete image about both ways of savings.
While simple interest grows evenly and linearly; for compound interest we observe small growth of interest during firs years, and near completion the period of saving the interest "explode", receiving very high interest, larger than the total deposit.
Therefore, compound interest is suitable for long-term investments or term deposits for a long time period to achieve and feel the real benefit and the "power" of its.
The formula for calculating the compound interest is the following:

$$S_n = S_0\left(1 + \frac{p}{100}\right)^n \qquad (5)$$

The components of formula (5) are:

S_n- represents total amount of money,
S_n- represents the initial deposit,
p – represents the interest rate expressed in %
n – represents the number of the years i.e. time of savings expressed in years.

If the interest is not calculate only at the end of the year, but also at the end of a period 1/m, where m is a natural number, then for a period 1/m, the percentage obtain once for the annual percentage is divided into the number of periods and thus we will get *p/m* periods.

For example:
m= - for semesters compounding,
m=4- for quarterly compounding,
m=12- for monthly compounding.

Analogous to this, for n periods with length of 1/m, in the case of a decursive compounding, is obtained the formula below:

$$S_{nm} = S_0\left(1 + \frac{\frac{p}{m}}{100}\right)^{nm} \qquad (6)$$

A. Savings are possible

In our country the population spends more than it saves.

In one hand, most Macedonians complains about theirs small monthly incomes and lack of money but the "complete image" in our capital city looks quite different.

Every day the coffee shops, discotheques and restaurants are crowded "all night long", the traffic jam is terrible due to the light cars and their frequent use, etc.

During my visits of some European metropolis I didn't saw that anywhere. In the working days, from 22:00 to 23:00 h you can meet only few people on the street and party days are limited only on the weekends.

In another hand, the citizens of the most developed countries like: Denmark, The Netherlands, Sweden, Austria, China; very often use bicycles. What are the benefits of riding bicycles?

In addition to better health and fitness form, protection at the environment, riding bicycle is also favorable for its own budget.

Every young employed Macedonian can easy save at latest 1.500,00 MKD per month, amount approximately equal with 25 euros. If he or she decreases the costs for fuel as result at using of the own car not so often, and in the same time will decrease the costs for parking. Also, above mentioned amount can be save if he or she renounces of a nice dinner with a tasty wine, in a fancy restaurant. If decreases everyday conversations with friends in the coffee-shops, etc.

V. EVERYONE CAN BECOME A MILLIONAIRE

It is recommended for everyone to learn to invest or save money to achieve the independence which savings offers.

For example: with 1.500,00 denars monthly savings in long-term for 30 years; I'm sure that everyone will be surprised when he will learns that after 27th year he has become millionaire.

This statement will be explain in detail in a realistic example, appropriate to the current banking offer in our country.

Using this example we will prove the power of 1compound interest; also, named "capitalization of interest" in the "financier's world".

A. Example of long-term saving in compound interest mode

We will analyze and calculate the compound interest on a long-term monthly investment and yearly compounding with an expected interest rate of 5% according to the model of investing in a private pension fund, in concordance with the current offer of the banks in our country. The example will refer to 30 years savings.

Although the offer of domestic banks for term deposits is limited to 5 years with a maximum interest rate of 3,5%; this situation does not limiting our long term savings because after ending first 5 years period we can renew the contract with the bank, again and keep saving.

Our strategy consists on:
- Initial deposit- 10.000,00 denars (162 euros),
- Regular monthly deposit- 1.500,00 denars (approximately 25 euros),
- Frequency of the deposit- monthly investment,
- Frequency of the calculating- decursive compound interest on annul basis,
- Number of years of investments- 30 years,
- Interest rate 5%.

B. Annual calculations of the analyzed example

At the end of first year:
- Initial deposit – 10.000 MKD,
- Regular deposits-1.500x12=18.000 MKD,
- Total deposits- 10.000+18.000=28000MKD,
- Total amount- 18.000+10.000x1,05=28.500 ,
- Total interest- 28.000-28.000=500 MKD

At the end of the second year:
- Initial deposit- 10.000 MKD,
- Regular deposit for 2 years- 2x18.000=36.000 MKD,
- Total amount for 2 years –
$$S = S_1 + S_0 \times \left(1 + \frac{5}{100}\right) =$$
=2x18000+28.500x1, 05 = 47.925 MKD,
- Total deposit- 10.000+36.000 = 46.000 MKD,
- Total interest- 47.925 – 46.000 = 1.925 MKD.

Analogous is calculated compound interest for all 30 years.

The table below content the calculations of savings and compound interest for all 30 years.

TABLE 2. CALCULATION OF TOTAL SAVINGS AND TOTAL INTEREST
WITH MONTHLY DEPOSITS AND YEARLY COMPOUNDING

Years	Total yearly deposit	Total interest
Initial deposit : 10.000, 00 MKD		
Monthly deposit :1.500,00 MKD		
1	28.000,00	500,00
2	46.000,00	1.925,00
3	64.000,00	4.321,00
4	82.000,00	7.737,00
5	100.000,00	12.224,00
6	118.000,00	17.837,00
7	136.000,00	24.627,00
8	154.000,00	32.659,00
9	172.000,00	41.991,00
10	190.000,00	52.691,00
11	208.000,00	64.826,00
12	226.000,00	78.467,00
13	244.000,00	93.690,00
14	262.000,00	110.577,00
15	280.000,00	129.203,00
16	298.000,00	149.664,00
17	316.000,00	172.047,00
18	334.000,00	196.449,00
19	352.000,00	222.972,00
20	370.000,00	251.720,00
21	388.000,00	282.806,00
22	406.000,00	313.346,00
23	424.000,00	352.464,00
24	442.000,00	391.287,00
25	460.000,00	432.951,00
26	478.000,00	487.599,00
27	496.000,00	525.379,00
28	514.000,00	576.448,00
29	532.000,00	630.970,00
30	550.000,00	689.119,00
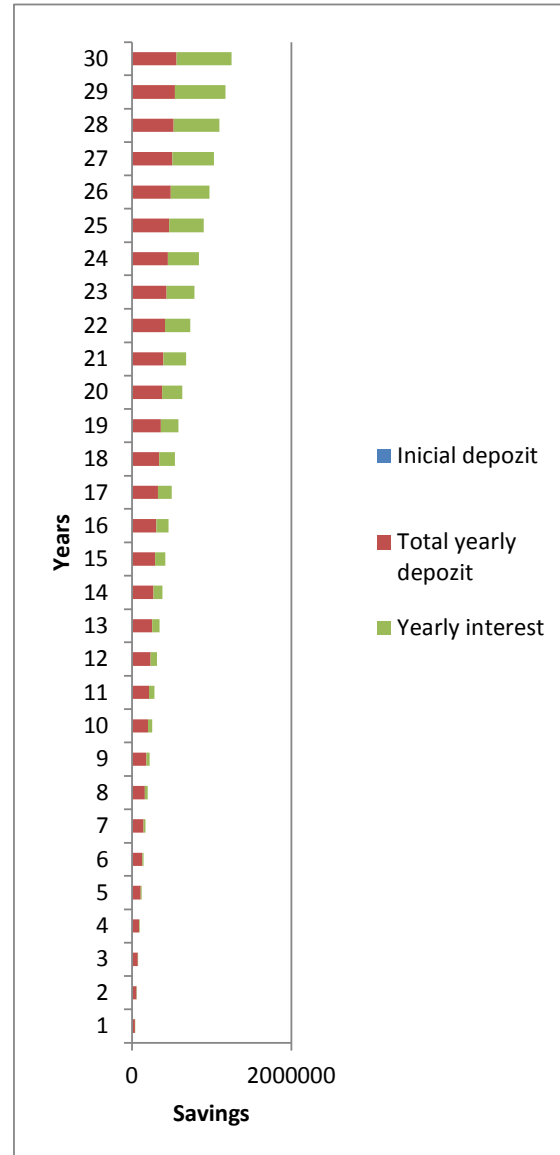
Figure 2. Graphic representation of the analyzed example

From the calculated data we can observe that the interest amounts has grown significantly over the years. Where, in the 30th year is reaches an amount higher than the total deposit. From 27th year onwards, the total amount is more then 1 000 000, 00 MKD.

This kind of savings is very effective and brings high yields to depositors.

From above mentioned statements we concluded that long-term savings in compound interest mode are useful for:

- Private pension funds, like III pension pillar,
- Reinvestment of dividends,
- Long-term deposits.

VI. CONCLUSION

Number e represent one of the most important constants in mathematics, physics, biology and other scientific branches.

Although the constant is named after the mathematician Leonhard Euler, the true merit for its calculation should be attributed to Jacob Bernoulli, who in 1683 has calculated the value of the mentioned mathematical constant while studying the problem of compound interest.

The solution to Bernoulli's problem proves that in case of continuous compounding in mode of compound interest the result is e^{Rt}; where number e represent natural exponential function

and the exponent is a product of R- the interest rate and t- time.

 Since that time, it was discovered that continuous compound interest grows exponentially.

The compound interest is suitable for long-term investments like: long-tern bank deposits, pension funds, investment in shares and reinvestment of dividends.

If every investor is sufficiently patient and disciplined to keep saving more than 20 years, will feel the deserved prosperity from obtained high yields; because compound interest is a powerful thing.

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Advantages of WPF .NET Technology in the Creation of the User Interfaces in C# Application

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Abstract - This paper describes the advantages and WPF .NET technology in the implementation of user interface applications in C # over currently used technology and Windows Forms applications. It's practically shown with implementation of the forms, WPF views, and user interface information system for the management and storage of finished products (SGP). Presentational logic, user interface and all views are created through the Windows Presentation Foundation (WPF) framework and Extensible Application Markup Language (XAML) forms, as are more modern, more practical and more detailed views of specific entities desktop applications compared to other technologies. The information system is realized with the programing language C # and the development environment of Microsoft Visual Studio 2017.

I. INTRODUCTION

Windows Presentation Foundation is a graphical subsystem in Microsoft Portfolio for rendering user interfaces in applications based on Windows. Using DirectX, reminiscent of similar XML-oriented models [1].

WPF uses XAML, an XML-based language to define and link different interface elements. WPF aims to combine some elements of a common user interface such as 2D / 3D rendering, fixed and adaptive documents, typography, vector graphics, animation and pre-displayed media. These elements can be related and manipulated on the basis of various events, user interaction and data binding.

The main goal of WPF is to help developers create attractive and efficient interfaces. The point is that many modern applications can benefit from providing interfaces that integrate graphics, media, documents, and other elements of modern user experience.

WPF form in itself can contain text and images with two-dimensional and three-dimensional graphics and video content, allows the user to create text notes, and also allows reading documents.

However, the creation of modern user interfaces is more than merely unifying formerly diverse technologies. It's also means taking advantage of modern graphics cards, so WPF can use any of the graphics processing unit (GPU) that is available in the system.

Modern interfaces so f e should not be limited to restrictions bit mapped graphics. Accordingly, WPF relies entirely on vector graphics, allowing the image to automatically resize to match the size and resolution of the display on which it is displayed. Instead of creating different graphics for display on a small monitor and a large-screen TV, the programmer can allow WPF to solve it.

By integrating all the technologies needed to create a user interface into a single foundation, WPF can make life much easier for people who create these interfaces. By requiring these people to learn just one environment, WPF can make the creation and maintenance of applications cheaper. By simply making interfaces that include graphics, videos, and more, WPF can improve quality and business value - as well as user interaction with Windows applications [9].

Extensible Application Markup Language or XAML is a language for marking documents based on XML and it is developed by Microsoft. XAML is the language used for visual presentation of the application, or the creation of a user interface, just as HTML is used in the creation of web applications. Using XAML defines the visible user interface elements that are in .xaml document and the code responsible for execution of the logic of application, is stored in .xaml.cs file.

II. ANALYSIS OF THE BENEFITS OF WPF TECHNOLOGY

A. Styles and templates

It is often useful to have an appearance of an

element defined once, and then reused elsewhere. Cascading Stile Sheets (CSS) allows it with HTML pages, for example. WPF provides something similar to styles. They allow better separation between designers and developers enabling the designer to create a unique interface appearance and allow the programmer to ignore these details. Using XAML-style elements, creator of WPF applications can define one or more visual aspects of certain element, and then apply that style several times. WPF styles are usually defined as a resource, the data being defined separately from the application code. The style can be derived from a different style, for example, inheriting and perhaps rearranging its settings. WPF also supports the use of templates, templates. The templates are similar to style.

B. Text

Most user interfaces show certain text. However, for most people, reading text on the screen can't be compared to reading the printed page. WPF makes text on the screen readable to them as a printed page. In this context, WPF supports industry standard OpenType fonts. It also supports ClearType technology.

C. Documents

Improvement of readability of on-screen text requires improvement of displaying documents. Therefore, WPF supports two types of documents: fixed documents and current documents. Fixed documents look exactly the same regardless of whether they are displayed on the screen or printed. Documents fixed format that is supported by WPF defines XPS. The content of a fixed document can be specified using the FixedDocument XAML element. While current documents are exclusively designed for display on the screen.

D. Pictures

Images are basic part of many user interfaces. In WPF, images are typically displayed by controlled, XAML image tags. The file containing the image is identified using the Source attributes. The image file can contain information about image metadata, and WPF applications can read and write this information. WPF allows images to be used on a much wider way than was the case in previous technologies. Control or tag images of WPF can display images stored in various formats, including JPEG, BMP, TIFF, GIF and PNG. It can also display images that are stored using Microsoft Windows Media Photo (VMPhoto) format.

Regardless of the format used, WPF relies on the Windows Imaging Component (VIC) to produce an image.

E. Video and audio

WPF provides built-in support for multimedia content. This support depends on the MediaElement tag, this tag can play WMV, MPEG and AVI video, along with various audio formats.

F. Two-dimensional graphics (2D)

Before creators of two-dimensional graphics in Windows relied on the graphics device interface (GDI) and his successor, GDI +. And even Windows Forms applications have to access this functionality through a different namespace. The situation was even worse with three-dimensional graphics, since a completely separate Direct3D technology was needed. With WPF, this complexity disappears for most applications. Both 2D and 3D graphics can be created directly in XAML or in the procedural code using WPF libraries. Like everything else in the WPF, the elements they use are just another part of the visual tree of the application. For 2D graphics, WPF defines a group of shapes that applications can be used to create images (lines, ellipses, rectangles, polygons, polyline, paths). Using these classes to create simple graphics is easy.

G. Three-dimensional graphics (3D)

Without WPF, 3D development on Windows usually relies on the Direct3D API. Although there are more cases when it makes sense to use Direct3D instead of WPF, Microsoft's intention is that 3D development for the Windows interface uses WPF. To display 3D graphics in WPF, the application uses the tag Viewport3D. Control Viewport3D can be used anywhere in the WPF interface, allowing 3D graphics to appear wherever it is needed.

H. Transformation and effects

WPF offers the ability to transform elements by rotating, changing their size, and more in XAML.

I. Animation

The ability to move elements in the interface, which can be animated, is very useful. To make this possible, WPF provides a class Storyboard. The goal is to allow developers to create user interfaces that provide better feedback, offer more functionality, and are all easier to use than they might otherwise be.

J.   Data binding

Most user interfaces show some types of data, data binding can be used to facilitate data presentation. Data binding allows you to directly connect what the WPF control displays with data that is out of that control. WPFs can also be linked to XML data directly using the Binding property of XPath. This option creates XPath query that selects one or more nodes in an XML document that relates to the specified data.

Microsoft's Windows Presentation Foundation (WPF) provides you with a development framework for building high-quality user experiences for the Windows operating system. It blends together rich content from a wide range of sources and allows you unparalleled access to the processing power of your Windows computer [3].

Finally, because of the described advantages and possibilities of WPF technology, it has been selected as a choice of technology for practical implementation the presentation layer of the application, or the user interface the final product storage software (SGP) which is described in the next chapter of this paper.

Most of the described features of WPF are implemented in the forms of this information system.

III.   USE CASE DIAGRAM OF FUNCTIONALITY OF THE REAL STORAGE SYSTEM OF FINISHED PRODUCTS AND ITS WPF VIEWS
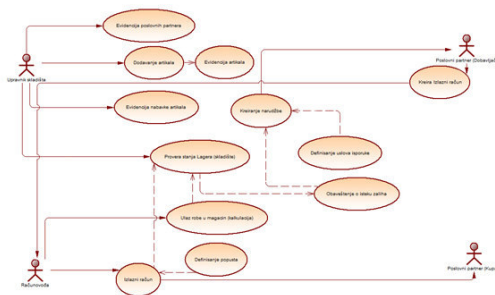
Figure 1. Use Case Diagram for Warehouse Manager, Accountant and Business Partners (suppliers and buyers)

Overview of the features and functionality of the real system view, as well as the connections between individual users of the system, are shown through the Use case diagram shown in the picture above.

The warehouse manager can monitor the records of business partners (to add, remove, search), add new products to the system, remove them and track their records, check stock status, notify suppliers about the expiration of inventory by creating an order. Since it can access only the company's business operations, the warehouse manager has user access rights to use the software. Once received orders Business Partner (supplier) with the goods delivers the output note to accountants of SGP the information system, what represents a calculation (input note) that enters the goods on the stockpile which increases its status, quantity and price as well as the indebtedness towards the supplier. Accountants may continue to create output notes for Business partners (customers), which reduces the condition and quantity of goods, as well as the value of the stock, after which it can also monitor the status of goods in stock and how much it is allowed under the status can notify business partner (supplier) on the expiration of inventory. Since it can be manipulated only financial work through the entrance of goods in stock and monitoring his condition, Accountants and has user rights. By showing a special Use case diagram for a third user, for example the owner of the company would see that he has the ability to access each module of the software (overview of the warehouse, financial and material business), since he can access all modules the owner has administrative rights.

All the individual functionalities of the described SGP system described here include: displaying, adding, editing and deleting items, as well as displaying, deleting, adding and previewing business partners, listing lists, creating, deleting and editing input / output accounts are practically created through WPF views and XAML languages.

Below is shown user interface of the software, WPF and XAML views , to preview , view, input and edit items, other forms of SGP software have a similar structure and logic, and their overview and explanations would exceed the scope of this paper.
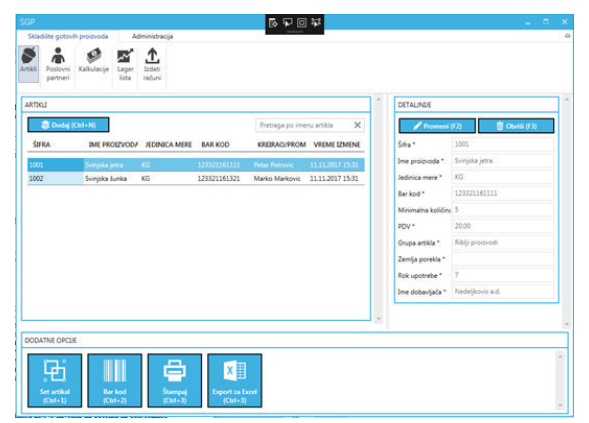
Figure 2. WPF UserControl, list form
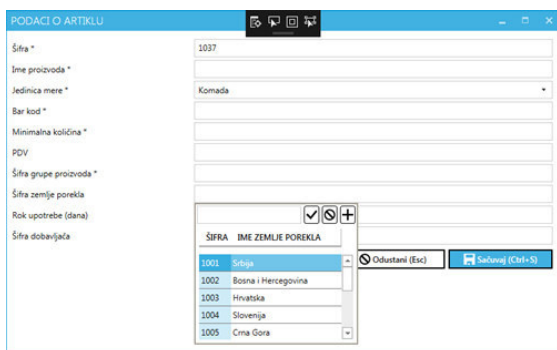
Figure 3. WPF Window, Add / Edit form

```
<UserControl x:Class="SGP.Views.Products.ProductList"
        xmlns="http://schemas.microsoft.com/winfx/2006/xaml/presentation"
        xmlns:x="http://schemas.microsoft.com/winfx/2006/xaml"
        xmlns:mc="http://schemas.openxmlformats.org/markup-compatibility/2006"
        xmlns:d="http://schemas.microsoft.com/expression/blend/2008"
        xmlns:local="clr-namespace:SGP.Views.Products"
        xmlns:Controls="clr-namespace:MahApps.Metro.Controls;assembly=MahApps.Metro"
        xmlns:iconPacks="http://metro.mahapps.com/winfx/xaml/iconpacks"
        mc:Ignorable="d" d:DesignHeight="600" d:DesignWidth="800">

    <Grid>
        <Grid.RowDefinitions>
            <RowDefinition Height="*" />
            <RowDefinition Height="Auto" />
        </Grid.RowDefinitions>
        <Grid.ColumnDefinitions>
            <ColumnDefinition Width="2*" />
            <ColumnDefinition Width="5" />
            <ColumnDefinition Width="*" />
        </Grid.ColumnDefinitions>

        <ScrollViewer Margin="5,0,5,10" Grid.Row="0" Grid.Column="0">
```

Figure 4. View XAML of the UserControl WPF View Code

IV. CONCLUSION

This was short description and reference to the WPF (Windows Presentation Foundation) technology, after which the same advantages are practically used and displayed in the creation of the user interface applications for the storage of finished products (SGP).

One of the more important features of WPF is displayed - separating the display of a user interface from defining its behavior. The display is specified by the described Extensible Application Markup Language (XAML), while the behavior can be implemented with the C # and .NET programming language as it was done in the paper. These two parts are linked through databinding, events and commands.

This separation of views and behaviors is accompanied by a series of benefits:

- display and behavior are loosely linked
- Designers and developers can work on separate models
- graphic design tools work with simple XML documents instead of coding
- A clearly defined separation of view and behavior allows a very slight change in the appearance of the control.

Using described and applied the principles resulted with this complex application. The goal was to create a solution to a modern, attractive, effective and functionally rich user interface which presents the opportunities provided by WPF which eventually was achieved. Implemented, of course, does not exhaust all the possibilities of WPF, but only practically shows and indicates the rich user interface that the WPF can provide.

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Distance Learning Models and Certification

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Abstract – Distance learning is becoming more and more important for students across the world. Distance learning provides effective knowledge acquirement, and is the cornerstone of informal education and certification. The main problems in this concept include the mechanism that ensure the validity of the acquired knowledge, and the validity of certain certificates. Online universities, and online classes provide sufficient knowledge for students. However, is this online material enough? Are students getting the same amount of quality education, and usable skills online, compared to students who attend classes? In this paper the concept and effectiveness of deep learning are addressed. In addition, a distance learning model is proposed. In sum, a thorough analysis is conducted with the goal to create a concise article that provides sufficient insight into the dynamics of distance learning.

I. INTRODUCTION

Education in its formal form is often affected by various factors, including location, time, lecture accessibility, and learning material accessibility. Students are eager to finish their studies as fast as possible, and to start getting returns from the education that they invested in. Thus, it is necessary to address other possibilities of education, and learning overall. New skills, and knowledge acquirement is a complex process, where formal models of education can have serious drawbacks. Time, and money are the main reasons that encourage students to seek other sources of knowledge, and information [1]. However, distance learning has its drawbacks, too, especially when it comes to learning equipment for experiments and prototype development. Certainly, online models of distance learning have made it possible for a large number of students to acquire higher education degrees [2]. Indeed, this is important for students who can't manage to travel or live near an education institution. Thus, the importance of distance learning, and distance learning models is open for debate.

In this paper the concept of distance learning is thoroughly analyzed. Furthermore, a distance learning model is proposed. The first section of this paper theoretically approaches the concept and characteristics of deep learning. The second section discusses the validity of distance learning and distance education certificates and their validity. In addition, a distance learning and certification model is proposed. Finally, conclusions are drawn and future research is suggested.

II. DISTANCE LEARNING

The advances of information technologies created a dynamic environment where information sharing, and information distribution is effective and efficient. This further created a strong basis for the development of distance learning systems. Distance learning integrates the use of computers, telecommunication, Internet and even the use of television and radio to share information and knowledge [5].

Literature in this domain is broad, and it addresses a wide variety of the deep learning concept. Firstly, distance learning was a viewed as grouped and categorized information about a specific subject. Over time, these subjects conjoined to form classes, and courses. The main service that manages the existence of distance learning is the Internet. Surely, the majority of university courses and seminars are found on the Internet rather than on television, or the radio. To create a stable distance learning model, it is necessary to analyze the major characteristics of distance learning [3], [4]. A large number of universities tend to develop distance learning systems that are equivalent to their formal form of attending classes.

Is this type of learning and education efficient and successful? Firstly, if the provided material is adequate, and the students are focused on acquiring knowledge, then the success rate of distance learning is higher. However, if students lack diligence, and the provided learning material is not high quality, then there is a great chance that learning is not efficient nor effective. Next, an important aspect of distance learning is the concept of distance. If the distance metric is thoroughly defined, and the source of knowledge is identified, then the effectiveness of the studying procedure is larger. It is argued that in a modern education system, online education, or online learning is important for the further development of education as a concept. This means that distance

learning is becoming a crucial concept when it comes to developing new models of education [6]. Even though distance learning has many benefits, it was noted that blended education that incorporates distance online learning and class attendance is superior to online distance learning strategies only [7].

Furthermore, the use of open source software for developing distance learning systems has a large advantage when it comes to the effectiveness of the learning material. This way, new content, new information can be added, and students can contribute to the database through constructive criticism and discussion [8]. Other important factors that contribute to the effectiveness of distance learning are: the institution that provides the learning material, the type of seminars and courses that are held, the level of authority that is provided and held over students, and the level of freedom that students have during the learning process.

The main characteristics of distance learning include the learning environment, the learning tools, and most importantly the design and learning methodology [9]. In the next section a theoretical distance learning and certification system model is proposed.

III. DISTANCE LEARNING AND CERTIFICATION MODEL

Before the model is presented the most important aspect of distance learning has to be addressed [10]. This includes providing support to the learners; providing access to the same quality material to the online students as to the class-attending; treating all students equally; avoiding bias; nurturing the intellectual integrity of the institution providing the distance learning course; respecting every student regardless of race, gender, and cultural background; and ensuring privacy and information confidentiality. The distance learning model proposed in this paper consists of four main modules. The first module are the students whose main goal is to acquire new and useful knowledge. The second module is the platform which the students use to access information and learning material. The third module is the database that includes the learning material. The fourth, and final module is the institution that provides the service of distance learning. On Figure 1, the mentioned modules are presented.
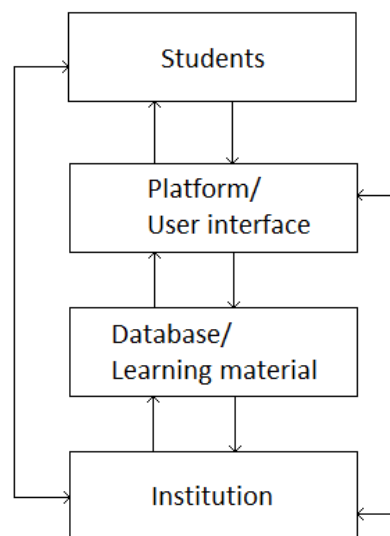
Figure 1.   The four main modules of the distance learning model

As mentioned before the "Students" module includes the student who are enrolled to specific seminars, courses and other educational content. Further, it can be seen that the "Students" module exchanges information with the fourth module "Institution", and also the main learning environment the "Platform" module. Information and data is exchanged through these channels.

The second module, the "Platform" includes a wide variety of tools that ensure an effective exchange of learning material and knowledge overall. Beside the students, teachers, and professors also participate in the learning process on the "Platform" module. This is illustrated with a connection with the "Institution" module that contains professors, and teachers as participants in the learning process. In addition the "Platform" module includes the necessary framework that supports the functioning of the distance learning system. The third module is the "Database" module. As the name suggests, this module stores the data and learning material which is fed to the platform upon request from the students. The "Institution" module includes the infrastructure of the distance learning system and every participant in the distribution knowledge. It can be seen that this proposed model is based on the interlaced connection between several main modules. On Figure 2, the "Platform" module is presented in more detail.
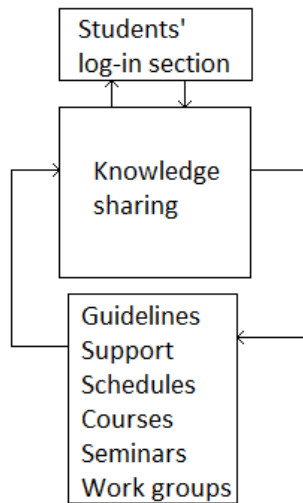
Figure 2. The "Platform" module of the distance learning model

It can be seen that the platform module includes several segments such as guidelines, support, scheduling and timetables of certain classes, information about the courses and specific seminars, and also workgroups where students can discuss problems and share their own ideas. Furthermore on Figure 3, the "Database" module is presented.
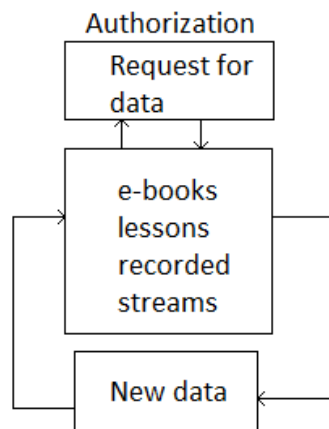
Figure 3. The "Database" module of the distance learning model

The "Database" module includes the section where the authorization occurs and the requests for data are processed. Further, the main body of the database stores various learning materials which can be in the form of e-books, lesson that are recorded, recorded streams from lectures, and other media files. At the bottom, the *new data section* is used to add data to database, in order to increase the stability of the database. Finally, on Figure 4 the "Institution" module is depicted.
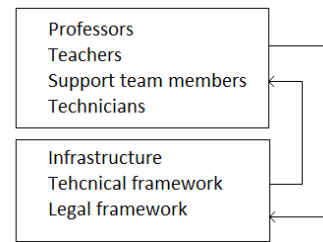
Figure 4. The "Institution" module of the distance learning model

According to Figure 4, the "Institution" module includes all the staff that work with students and on the main infrastructure of the distance learning system. In addition, the module includes the main infrastructure that may be a university, an organization, company or any service that provides the necessary resources that ensures an effective distance learning system.

When it comes to certification of acquired education through distance learning, it is necessary to implement valid mechanisms that will test the acquired knowledge of participants in an effective and strict way. The global scale of information distribution has a positive influence on acquiring new knowledge, however, this knowledge must be validated and credible in order to productively apply it [11]. The increased use of the Internet has made it possible to thousands of students to enroll in high quality education. Now, the majority of these sources has high quality learning material. However the testing segment of the learning process is often flawed [12]. This was confirmed in other research as well [13]. The certification process should be taken even more seriously than the material needed to pass the test to acquire said certificate. Therefore, it can be assumed that the validation of the knowledge carried by a participant is the main goal of the whole distance learning process. In the next section, conclusions are drawn.

IV.   CONCLUSION

Based on the proposed model, it can be concluded that developing a modern distance learning system is complex and requires extensive resources. Today, a remarkable number of online courses are available for students. A large number of these courses are free of charge. However, it was already discussed that the credibility of the certificate of these courses are questionable. Even though the learning material is high quality, if the testing process is not regulated accordingly, then the certificate that results from this testing is not a sufficient indicator of acquired knowledge.

Therefore, it is necessary to implement a valid and credible certification process. Without it, the majority of the existing online courses and other distance learning models can't compete with formal education. However, the determination for studying of students is a major influential factor that affects the results obtained from the learning process. This means that students who are not willing to learn extensively, but rather aim at getting the certificate after the online course, are less likely to obtain adequate amounts of knowledge and skill, regardless of the testing process. On the other hand, diligent, and eager to learn students are more likely to acquire useful and practically usable knowledge and skills even without testing. In sum, for future research, a survey should be conducted in order to determine the effectiveness of certain distance learning models.

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Using Note-Taking Applications in Higher Education

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Abstract – **Development of smart phones contributes to the expansion in education, i.e. the appearance and development of mobile applications intended for use in educational purposes. This paper presents three note-taking applications that enable creating, saving and sending electronic notes. Notes depending on the tool used can consist of text, photographs, audio or video, word files. The paper shows the results of the conducted research that represent a kind of grade of the chosen note-taking applications, from the students' view. The aim of the paper is to point out the performances of using note-taking applications as well as to, according to the students' grades, point out the possibility of their use in class.**

I. INTRODUCTION

One of the current trends in the digital era is shifting from paper to electronic data. Information which was previously stored only in printed form, since the end of the previous millenium is more and more digitalized and used in electronic form. The appearance of smart phones enabled the phones to be used as a means for creating, visualization or storing data.

Our country does not sufficiently recognize the implementation of mobile phones for educational purposes, whereas the situation in the world is completely different. During 2012 The Educause Center for Applied Research [ECAR] conducted research regarding the application of mobile phones in higher education. Research results showed that 67% of surveyed students believed that applying mobile phones is important for achieving better results during studies [1].

Mobile devices can contribute in different ways to the students' education process, e.g. for accessing or sharing class material, for communication with the professors and other students, etc. However, not less important is their application during the class itself, and one of the ways for that is their use for making notes during class.

Notes help students acquire new knowledge. Making notes represents an important aspect of learning in the classroom. Students paying more attention to it, achieve better results during studies.

In favour of notes being important and an essential part of each students' life is the fact that in our country in 2009 a site called „Beleške" (eng. Notes) was created, available at the Web. The site's authors formed and regularly edit the knowledge and information base which pupils and students need during their education process, i.e. studies. Their content is regularly followed by several thousands of young.

When refering to notes, one first thinks of handwritten text or sketches. Instead of row data it is desirable to use as many graphs, tables, audio, photographs, etc. as possible. Introducing mobile applications for creating notes in the process of teaching completely changes the way in which students acquire and process information [2]. Instead of drawing from the blackboard onto paper, using mobile phones they can make notes which include photographs showing what the teacher wrote on the blackboard. And it is precisely here that the help of the application is revealed. It is shown in more detail and tested in this paper.

In light of above-mentioned, the research question for this study is: "What is the students' experiences when traditional note-taking method is replaced with an electronic method?"

This paper is divided into 5 sections including this introductory remark. In section 2 there is an explanation of note-taking tools. The method of survey is given in the Section 3. Research results are shown in section 4. Section 5 provides conclusion.

II. NOTE-TAKING APPLICATIONS

This part shows in more detail the characteristics of tested note-taking applications.

The main criteria for choosing applications is:
- Average grade that the application got on Google Play store.

- Number of users on a global level.

- The existance of a free version.

- Recommendations that can be read at specialized sites such as: pcmag.com, techradar.com, collegechoice.net and academictechnologies.it.miami.edu.

Based on the beforementioned, three application were chosen and they are: Google Keep, Microsoft OneNote and Evernote.

A. Google Keep

The first chosen application is Google Keep. According to official results [3] it currently has more than 670.000 users. The application is free, and the average grade on Google Play Store is 4.4. It was developed in 2013 [4].

Eventhough designing an Android application is a great challenge for people doing it, for Google Keep we can say that the designers did an excellent job. Google Keep has a simple but likeable design, which is intuitive. The average user does not need a training to be able to use it.

Google Keep is the simplest note-taking application which our students tested. With the possibility to write down something quick and easy, Keep enables creating a reminder, making sketches, recording voice messages or photographs. The made content is easily searched. Additionally, Google Keep gives you a possibility to label, color, and pin notes. A note made in this tool is shown in Figure 1.

At the official application blog site [4] it is stated that the application gives the user the possibility to speak and record a voice message when on the move (while walking) which Google

will later automatically transcribe.

Apart from the mentioned, the application gives the possibility of sharing the created notes. Since we live in a time when it is necessary to make and at the same time share the information with others, this possibility makes Google Keep an extremely useful application.

From other functionalities that should be mentioned is the possibility to use the application on different platforms such as Android or iOS. It can also be used on the web, at https://keep.google.com and all that is necessary is for the user to sign in and log in to their Google Account.

The storage space that a user gets is dependent on Google Drive storage. By default, amount of free storage is 15 GB but it can be expanded by payment.

B. Microsoft OneNote

According to Play store data [3] OneNote currently has about 440.000 users, the application is free, and the average grade is 4.4.

OneNote represents a personal, digital notebook that enables making notes from the lecture or meeting, creating task lists or drawings. This tool can be used by individuals but also collaborating teams.

OneNote uses pages, sections, and notebooks to organize data. OneNote allows creating notebooks which is shown in the Figure 2.

Figure 2. Notebooks.
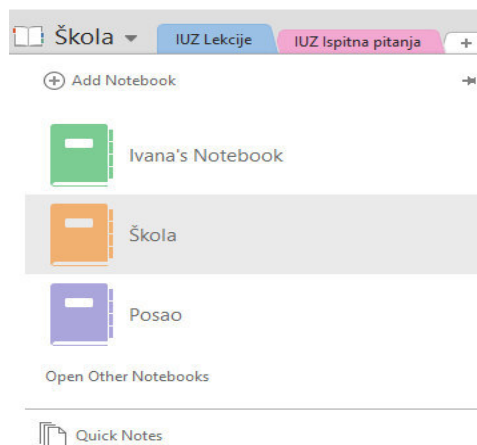
In this way the user can create notebooks for different purposes, e.g. for school, work, or fun. Each notebook contains sections that represent different categories (sections are represented by

Figure 1. To do list created using Google Keep.

tabs), and within each section it is possible to create an arbitrary number of sheets where the user writes his notes. When it comes to the content of notes, the user has the freedom to type in text or independently create drawings, add audio or video files and real screenshots.

Compared to competition applications tested in this paper, OneNote has a few features which other tools do not have. Some examples are the ability to embed an Excel table or other Microsoft Office files. It is possible because OneNote is a part of Microsoft Office family.

Compared to competition applications tested in this paper, OneNote has a few features which other tools do not have. Some examples are the ability to embed an Excel table or other Microsoft Office files. It is possible because OneNote is a part of Microsoft Office family.

Similar to other applications of the same purpose it is possible to use notes with this tool independently or they can be sent to other users.

OneNote has applications for all platforms and devices used today, and notes can be accessed through the web. For using any version of this application a Microsoft account is necessary.

Microsoft OneNote uses OneDrive as a storage
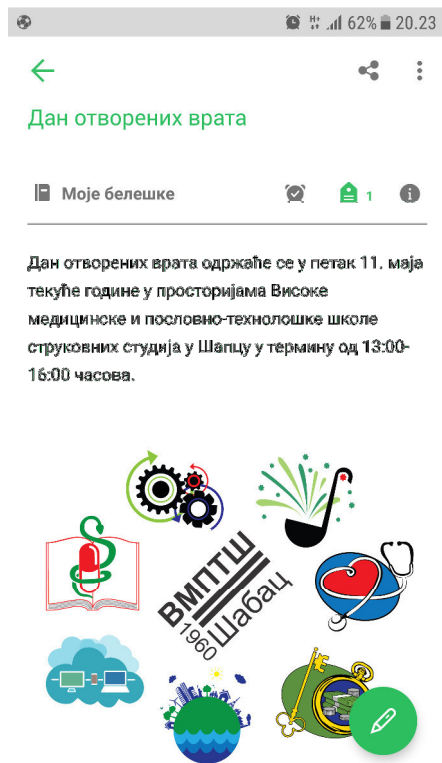
Figure 3. Note made using Evernote tool.

space. All stored data, after synchronization are available on all devices on which OneNote is installed [5].

C. Evernote

Evernote is one of the oldest application for storing and organizing data. Additionally, it is the most popular and the most used note-taking app. It has around million and a half users and 4.6 grade [3]. This represents the biggest average grade compared to the other two tested applications.

When compared to the abovementioned tools, the possibilities which this tool provides are diverse and more numerous.

Evernote incorporates the functionality of a traditional paper notebook and a word processor [6]. This tool has an interface specially tailored to meet the students' learning needs. Simply, Evernote meets the needs of everyone. Even business people, or ordinary users can use Evernote to organise their work tasks or personal life.

In terms of data organisation, Evernote provides creating notes, notebooks and tags. Also it has a simple search and data retrieval option. As a collaborative tool, it makes it easy to share notes with other people. Example of a notes created in this tool are given in Figure 3. and Figure 4.

A characteristic of this tool is the possibility to create reminders, adding files of different extensions, making audio or video files, using a pencil to write on the device screen. For those who want to save things from the web like: web pages, simplified articles, articles, bookmarks or screenshots a web clipper extension is of great importance.

Like their competition it is available in several forms: as a program for Windows PC or MAC computers or as a version for mobile devices. Also, Evernote is a web based tool. Similar to Google Keep, a Google Account is required for web access.

The application comes in three versions: Basic, Premium and Business. The first version is free, whereas you need to pay a user fee for others on a monthly or yearly basis.

According to the used version, the user has at his disposal a smaller or larger number of functions. The first thing which is noticed is the difference in memory size and number of devices that can be used. The free version has a possibility of 60 MB upload on a monthly level and the

possibility to use the application on two devices the most [8], whereas with the commercial versions the user has bigger memory space and the possibility to synchronize data between all used devices.

III. METHOD OF SURVEY

For the needs of this paper a survey was conducted in the period from October 2017 to January 2018 in which students of the Higher Medical and Business-Technological School of Applied Studies in Šabac participated. 70 students of the second year of Informational technology studies participated in the survey. 55 students successfully completed the research. They had a task to use all three chosen applications for making notes during the winter semester. After the finished testing period, students which successfully completed the application testing, answered questions by interview method. The investigators were the paper authors. Questions were asked orally using prepared questionnaire. The students' answers were recorded by the investigators and based on them they made conclusions.

IV. SURVAY RESULTS

Students used all three applications according to their needs, knowledge and personal preferences. According to their results, all tested applications have user-friendly interface and

Figure 4. Note made using Evernote tool.

completely meet the students' needs and expectations regarding their use in class. Applications proved to be stable and no problems were perceived in their work.

The biggest number of students responded that the Evernote tool possesses the most functionality which they as IT students mostly need. On the other hand, the biggest part of them noted that Google Keep as an intuitive tool and easy to use, i.e. is suitable for use to students who do not study IT.

During testing it was noted that all applications after deinstallation and upon being installed again keep all previously made notes. In case that the user replaces his device with a new one or uses several devices, thanks to the synchronization possibility his notes will be available on all devices.

When asked which out of the three tested applications could meet the needs of most students studying different subjects, the largest number of examinees said Google Keep as a tool that could replace pen and paper during studies. Based upon examinee answers one of the suggestions for Google Keep use would be to create a virtual information board for the next school year.

Based upon test results, one can conclude that Google Keep got the highest grade from examinees participating in the research. Considering the current user number of this application and compared to the grade got by conducted research for the purpose of this paper, it is expected that in the future the user number for this application and its use in educational purposes will be considerably higher.

V. CONCLUSION

The modern business surroundings, globalization, rapid changes, demand and require adapting the educational institutions to them. In order to survive and continue their improvement according to the newest changes, it was inevitable to adjust to modern trends in education. Note-taking applications represent just one of the possibilities of applying mobile phones and other portable devices in class.

The speed with which we can access data which the presented tools enable, better legibility, adding pictures, the browsing option, sharing information as well as the possibility for the users to always have their notes with them, are some of the advantages due to which there tools will in the
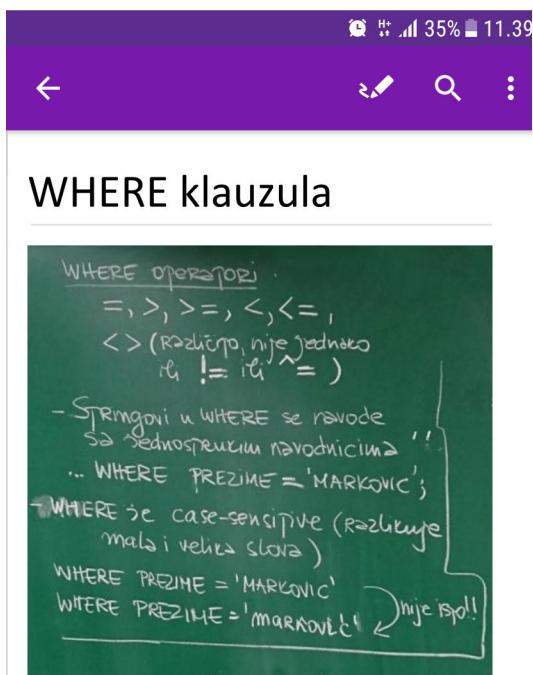
future replace the traditional manner of taking notes. All students will have benefits of such manner of work, but teachers as well who can use these tools for preparing and implementation in class.

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Dynamical Analysis of Two Cubic Discrete Dynamical Systems

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Abstract - The dynamical analysis for two cubic discrete dynamical systems which depend from changing of a real parameter will be done with analyzing and classification of the stability in the fixed points, analyzing of periodical orbits with period two and analyzing of their bifurcation diagrams as in [1], [2]. As a tool for system analysis mathematical software Mathematica is used.

I. INTRODUCTION

The theory of dynamical systems attempts to understand, or at least describe, the changes over time or in discrete time steps that occur in physical and artificial systems. Areas of biology, physics, economics and applied mathematics involve an analysis of systems like these, based on the particular laws governing their change. The part of the theory of dynamical systems which research the changing of the system state in discrete time steps is known as a discrete dynamical system. We can analyze maps as a discrete dynamical system, and such dynamical analysis is reviewed in numerous mathematical literature like in [1] – [16].

A dynamical analysis of linear or square maps (especially the logistic maps) which depend on only one parameter is not new and they can be found in the numerous papers as in [1], [2], [3], [4], [9], [11], [12], [14] and [15].

In this paper, we will analyze two cubic maps:

$$f(x) = x^3 + ax^2 + ax \qquad (1)$$
$$f(x) = -ax^3 + x^2 + ax, a \neq 0 \qquad (2)$$

where a is a real parameter. The dynamical analysis for cubic maps can be found in [13] and [16].

We will review these cubic maps (1) and (2) in aspect of difference equations which are considered as discrete dynamical systems. The analysis of the dynamic of the system will be done

with: analyzing and classification of the stability of her fixed points, analyzing of periodical orbits with period two and analyzing of their bifurcation diagrams which depends of real parameter changing (as in [1], [2]). As a tool for their analysis mathematical software Mathematica is used. The codes for drawing diagrams in Mathematica can be found in [5], [6], [13] and [14].

The theoretical basis for fixed points, periodical orbits and bifurcation diagrams can be seen in [3], [5], [8], [9] and [10]. Each of these cubic maps for the real parameter a are reviewed as a difference equation $x_{n+1} = f(x_n)$, where $f : R \to R$ is a map. We analyze where the point or subset of R is mapped iteratively with f. This difference equation $x_{n+1} = f(x_n), n \in N_0$ defines the discrete dynamical system *(R, f)* with dynamics $f^n, n \in N_0$ that is given by the iterations of the map *f*.

The mapping of the point *x* of *R* iteratively by *f* presents a description of a trajectory of *f* with start at the point *x*. The trajectory of *f* with start at the point $x \in R$ is the array

$$x = x_0 = f^0(x), x_1 = f(x_0), x_2 = f(x_1) = f(f(x_0))$$
$$= f^2(x_0),..., x_{n+1} = f(x_n) = f^n(x_0),...$$

The set of all maps $f^n(x)$ obtained with iteratively mapping by *f* is the orbit of the point *x* and is marked with $orb(x) = \{y \mid y = f^n(x), n \in N_0\}$.

For the discrete dynamical system defined by the difference equation $x_{n+1} = f(x_n) = f^{n+1}(x_0)$ the point $x \in R$ is called a fixed point for the map *f*

if $f(x) = x$ i.e. $orb(x) = \{x\}$. The fixed point can be the stable point (attractor) or the unstable point (repeller), depending on the first derivative of the function at that point x i.e.

1. If $|f'(x)| > 1$ then x is an unstable fixed point;

2. If $|f'(x)| < 1$ then x is a stable fixed point.

For discrete dynamical system defined with the difference equation $x_{n+1} = f(x_n) = f^{n+1}(x_0)$, the point $x \in R$ is calling a periodical point of f if there is an integer number $n>1$, for which $f^n(x) = x, f^{n+1}(x) \neq x$. The smallest positive integer n with this property is called a period of x. The orbit of the point x has exactly n points and it is called a periodical orbit.

Monitoring the changes in a mapping, depending on a parameter, gives the dynamics of that mapping viewed as a discrete dynamical system. These qualitative changes are analyzed by bifurcation diagrams for which dynamical system is reviewed as a function depending on a parameter.

II. FIXED POINT OF THE MAPS

Analytically, the finding of periodic points with a period n is obtaining a solution for the equation $f^n(x) - x = 0$. For every polynomial $f(x)$ with the exponent 3, n-the iteration $f^n(x)$ is the polynomial with the exponent 3^n and it has maximum 3^n various solutions. The equation $f^n(x) - x = 0$ has maximum 3^n solutions. Then we obtain 3^n periodical points with a period n. The fixed points are obtained when $n=1$.

For each of the cubic maps (1) and (2) will be given characterizations of the fixed points when parameter is changing by solving the equation $f(x) - x = 0$ (analytical) and with graphical presentations by describing the orbits of quite arbitrarily and conveniently selected points x. Because the maps are cubic maps, the equation $f(x) - x = 0$ is the cubic equation and gives three solutions as candidates for fixed points.

The cubic map (1): By solving the equation $x^3 + ax^2 + ax = x$, the fixed points $x^{(1.1)} = 0$, $x^{(1.2)} = -1$ and $x^{(1.3)} = -a+1$ are obtained. From the first derivative $f'(x) = 3x^2 + a + 2ax$ of (1) we have the

following characterizations: For $x^{(1.1)} = 0$ and $|f'(0)| = |a| < 1$ imply that when $-1 < a < 1$ then the point is an attractor, but for $a > 1$ or $a < -1$, it is a repeller. For $x^{(1.2)} = -1$ and $|f'(-1)| = |3 - a| < 1$ imply that when $2 < a < 4$ then the point is an attractor, but for $a > 4$ or $a < 2$, it is a repeller. For $x^{(1.3)} = -a+1$ and $|f'(-a+1)| = |a^2 - 3a + 3| < 1$ imply that when $1 < a < 2$ then the point is an attractor, but for $a > 2$ or $a < 1$, it is a repeller.

In figure 1 are shown the orbits for the points x=-2, x=1 and x=3.2 with 4 iterations and the orbit x=-0.25 with 10 iterations for the parameter a=-2 where can be seen that all the fixed points $x^{(1.1)} = 0$, $x^{(1.2)} = -1$ and $x^{(1.3)} = 3$ are repellers.
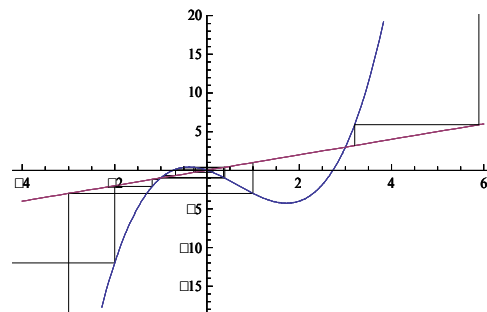
Figure 1. Orbits of the points x=-2, x=1, x=-0.25 and x=3.2 for the map (1) with a parameter a=-2

The cubic map (2): By solving the equation $-ax^3 + x^2 + ax = x$, the fixed points $x^{(2.1)} = 0$, $x^{(2.2)} = 1$ and $x^{(2.3)} = \dfrac{-a+1}{a}$ are obtained. From the first derivative $f'(x) = -3ax^2 + 2x + a$ of (1) we have the following characterizations: For $x^{(2.1)} = 0$ and $|f'(0)| = |a| < 1$ imply that when $-1 < a < 0$ or $0 < a < 1$ then the point is an attractor, but for $a > 1$ or $a < -1$, it is a repeller. For $x^{(2.2)} = 1$ and $|f'(1)| = |-2a + 2| < 1$ imply that when $\dfrac{1}{2} < a < \dfrac{3}{2}$ then the point is an attractor, but for $a > \dfrac{3}{2}$ or $a < \dfrac{1}{2}, a \neq 0$, it is a repeller. For $x^{(2.3)} = \dfrac{-a+1}{a}$ and

$|f'(\dfrac{-a+1}{a})|=|\dfrac{-2a^2+4a-1}{a}|<1$ imply that when

$\dfrac{1}{4}(5-\sqrt{17})<a<\dfrac{1}{2}$ or $1<a<\dfrac{1}{4}(5+\sqrt{17})$ then the point is an attractor, but for

$a<0, 0<a<\dfrac{1}{4}(5-\sqrt{17}), \dfrac{1}{2}<a<1$

or $a>\dfrac{1}{4}(5+\sqrt{17})$, it is a repeller.

In figure 2 are shown the orbits for the points x=-0.75, x=0.5, x=2 and x=3.5 with 4 iterations for the parameter a=0.25 where can be seen that the fixed points $x^{(2.1)}=0$ and $x^{(2.3)}=3$ are attractors and $x^{(2.2)}=1$ is a repeller.
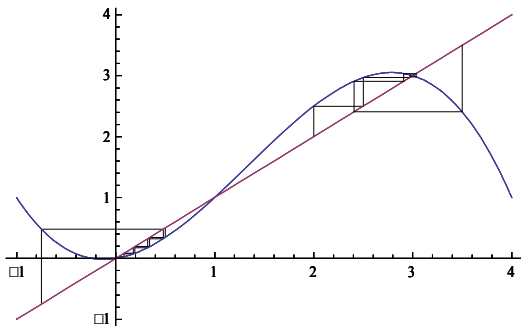
Figure 2. Orbits of the points x=-0.75, x=0.5, x=2 and x=3.5 for the map (2) with a parameter a=0.25

III. PERIODICAL ORBITS WITH PERIOD 2

The periodical points with period *2* are obtained as a solution of the equation $f^2(x)-x=0$ which is the polynomial equation with the exponent $3^2=9$ and it can have maximum *9* solutions (including complex solutions). Three of the solutions are the fixed points for *f(x)* and the other six solutions are the periodical points with period *2* or *2*-cycles points i.e. the fixed points for $f^2(x)$. Geometric interpretation is the intersection of $f^2(x)$ with the line *y=x*. Our focus will be only on real *2*-cycles points. The evaluating for *2*-cycles points {a, b} will be done with equation (3)

$|(f^2)'(a)|=|f'(a)f'(b)|$ (3)

From the equation $f^2(x)-x=0$, for the map (1), we obtained an equation with the exponent 9:

$a^2 x+a^2 x^2+a^3 x^2+a x^3+3 a^3 x^3+2 a^2 x^4+$
$4 a^3 x^4+5 a^2 x^5+3 a^3 x^5+a x^6+6 a^2 x^6+$
$a^3 x^6+3 a x^7+3 a^2 x^7+3 a x^8+x^9=0$

By its solving in Mathematica the following solutions are obtained:

$x \to -1, x \to 0, x \to 1-a,$

$x \to \text{Root}[1+a+(a+a^2)\#1+(1+a+2a^2)\#1^2+(2a+2a^2)\#1^3+(1+2a+a^2)\#1^4+2a\#1^5+\#1^6\&, 1],$

$x \to \text{Root}[1+a+(a+a^2)\#1+(1+a+2a^2)\#1^2+(2a+2a^2)\#1^3+(1+2a+a^2)\#1^4+2a\#1^5+\#1^6\&, 2],$

$x \to \text{Root}[1+a+(a+a^2)\#1+(1+a+2a^2)\#1^2+(2a+2a^2)\#1^3+(1+2a+a^2)\#1^4+2a\#1^5+\#1^6\&, 3],$

$x \to \text{Root}[1+a+(a+a^2)\#1+(1+a+2a^2)\#1^2+(2a+2a^2)\#1^3+(1+2a+a^2)\#1^4+2a\#1^5+\#1^6\&, 4],$

$x \to \text{Root}[1+a+(a+a^2)\#1+(1+a+2a^2)\#1^2+(2a+2a^2)\#1^3+(1+2a+a^2)\#1^4+2a\#1^5+\#1^6\&, 5],$

$x \to \text{Root}[1+a+(a+a^2)\#1+(1+a+2a^2)\#1^2+(2a+2a^2)\#1^3+(1+2a+a^2)\#1^4+2a\#1^5+\#1^6\&, 6]$

This shows that the first three solutions are the fixed points, but the other six can be obtained only by numerical solving for the concrete values of the parameter a.

Example   1:   For   the map $f(x)=x^3-1.5x^2-1.5x$, the second iteration has five real fixed points:

{x→-1.}, {x→0.}, {x→2.5} – the fixed points for f(x) which are repelleres;

{x→-0.480752}, {x→0.263332} – 2-cyrcles points with using the rule (3). These points form an orbit {-0.480752, 0.263332} which is an orbit-repeller.

Another four solutions of the equation $f^2(x)-x=0$ are complex solutions.
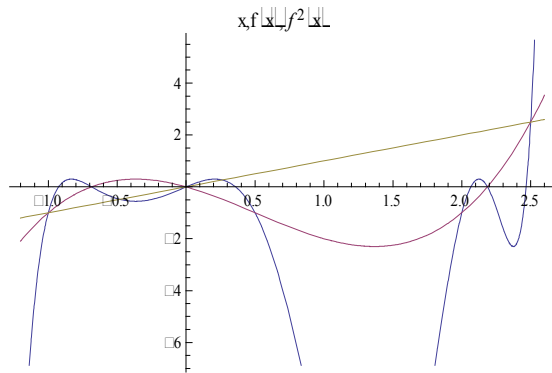
Figure 3. The first and second iteration for the map (1), a=-1.5 with unstable points with period 1 and 2

Example 2: For the map $f(x) = x^3 - x^2 - x$, the second iteration has three real fixed points:

{x→-1.}, {x→0.}, {x→2} – the fixed points for f(x) which are repellers;

There are not *2*-cycles points.

Another six solutions of the equation $f^2(x) - x = 0$ are complex solutions.
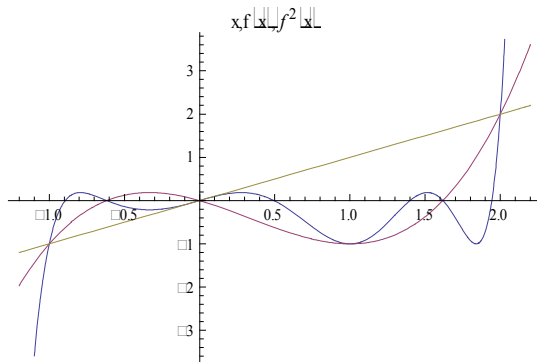
Figure 4. The first and second iteration for the map (1), a=-1 with unstable points with period 1

From the equation $f^2(x) - x = 0$, for the map (2), we obtained an equation with the exponent 9:

$$a^2 x + a x^2 + a^2 x^2 + 2 a x^3 - a^2 x^3 - a^4 x^3 + x^4 - 2 a^2 x^4 - 3 a^3 x^4 - 2 a x^5 - 3 a^2 x^5 + 3 a^4 x^5 - a x^6 + a^2 x^6 + 6 a^3 x^6 + 3 a^2 x^7 - 3 a^4 x^7 - 3 a^3 x^8 + a^4 x^9 = 0$$

By its solving in Mathematica the following solutions are obtained:

$$x \to 0, \ x \to 1, \ x \to \frac{1-a}{a},$$

$$x \to \text{Root}\big[-1 - a + (-1 - a)\#1 + (-1 + a + a^2 + a^3)\#1^2 + (2a + 2a^2)\#1^3 + (a - a^2 - 2a^3)\#1^4 - 2a^2\#1^5 + a^3\#1^6 \&, 1\big],$$

$$x \to \text{Root}\big[-1 - a + (-1 - a)\#1 + (-1 + a + a^2 + a^3)\#1^2 + (2a + 2a^2)\#1^3 + (a - a^2 - 2a^3)\#1^4 - 2a^2\#1^5 + a^3\#1^6 \&, 2\big],$$

$$x \to \text{Root}\big[-1 - a + (-1 - a)\#1 + (-1 + a + a^2 + a^3)\#1^2 + (2a + 2a^2)\#1^3 + (a - a^2 - 2a^3)\#1^4 - 2a^2\#1^5 + a^3\#1^6 \&, 3\big],$$

$$x \to \text{Root}\big[-1 - a + (-1 - a)\#1 + (-1 + a + a^2 + a^3)\#1^2 + (2a + 2a^2)\#1^3 + (a - a^2 - 2a^3)\#1^4 - 2a^2\#1^5 + a^3\#1^6 \&, 4\big],$$

$$x \to \text{Root}\big[-1 - a + (-1 - a)\#1 + (-1 + a + a^2 + a^3)\#1^2 + (2a + 2a^2)\#1^3 + (a - a^2 - 2a^3)\#1^4 - 2a^2\#1^5 + a^3\#1^6 \&, 5\big],$$

$$x \to \text{Root}\big[-1 - a + (-1 - a)\#1 + (-1 + a + a^2 + a^3)\#1^2 + (2a + 2a^2)\#1^3 + (a - a^2 - 2a^3)\#1^4 - 2a^2\#1^5 + a^3\#1^6 \&, 6\big]$$

The result is same as for the map (1). The first three are the fixed points and the other six can be obtained only by numerical solving for the concrete values of the parameter a.

Example 3: For the map $f(x) = -1.1x^3 + x^2 + 1.1x$, the second iteration has five real fixed points:

{x→0.} – the fixed points for f(x) which is repeller;

{x→1.}, {x→-0.0909091} - the fixed points for f(x) which are attractors;

{x→-1.16137}, {x→ 1.79433} – 2-cyrcles points with using the rule (3). These points form an orbit {-1.16137, 1.79433}.

Another four solutions of the equation $f^2(x) - x = 0$ are complex solutions.
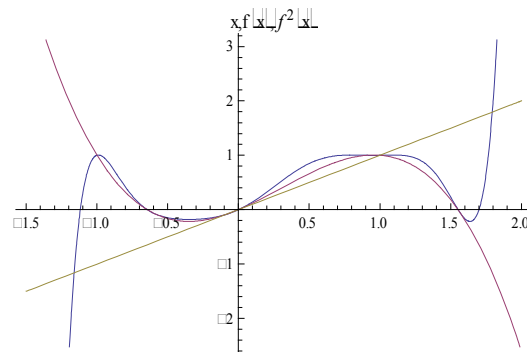
Figure 5. The first and second iteration for the map (2), a=1.1 with unstable points with period 1 and 2

Finally, the bifurcation diagrams which are given in figure 6 for the maps (1) and in figure 7 for the maps (2) respectively shown their chaotic behavior.
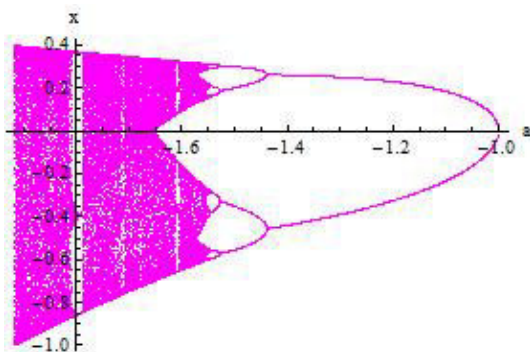
Figure 6. Bifurcation diagrams for the maps (1)
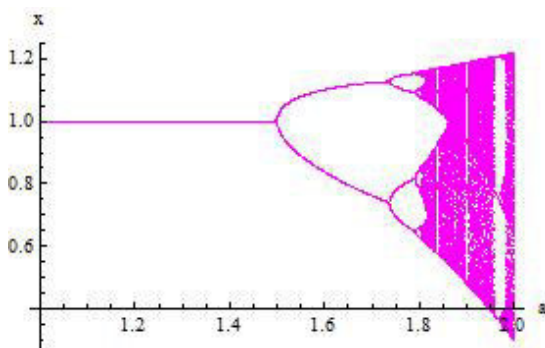
Figure 7. Bifurcation diagrams for the maps (2)

IV.   CONCLUTION

These cubic maps (1) and (2) have complicate behavior, because the finding of the solutions for the equation in them with using a computer is a complex case. The periodical points with the period 2 can be obtained only by numerical solving for the concrete values of the parameter. This explanation showed that finding of the

intervals for the parameter *a* of this way (where 2-cycle points exist) is an almost mission impossible.

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Knowledge of Knowledge and it′s Impact on Business Failure of Enterprises Based on Innovative Business

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Abstract - This paper presents the knowledge as a factor of successful company development, and also focuses on obsolescence of knowledge which is a factor in the failure of companies to market in the market. The aim of the paper is to present knowledge as a very important factor of business success. Enterprises without human capital make a failure in comparison to the competition their business becomes inefficient and unproductive.
Key words - knowledge, obsolescence of knowledge, learning, business success, failure factors, human capital

I. INTRODUCTION

In times of development at all levels and in many spheres of life there is a need for constant improvement. Modern business requires a constant education of employees. If success is desired and one should not be allowed to become ignorant. Knowledge is used to interpret information about basic circumstances or the case of managing the situation. Knowledge possesses and represents many conceptual levels, in many forms, many types and many areas [8]. The literary sources used in this paper illustrate the great problem of obsolescence of knowledge that results in negative market placement. Man's need for continuous learning involves mastering scientific information and mastering the means of compassion, and it relates to the realization of the essence of meaningful life, the development of the ability to learn, understand and discover, to focus attention, memory and thinking [15]. It is considered that it is necessary to continually improve employees at all hierarchical levels. It is necessary in one continent to work on additional education of the entire collective in all spheres of business. Leaders must look and learn from the business failure of the company. In order to achieve business excellence, it is necessary to turn every failure into success.

II. CHALLENGES OF A MODERN BUSINESS COUNCIL

With the development of new technologies, the modern business world faces many business challenges. Companies are expected to become much more flexible and to adapt their business to modern innovative business in one continuous process. Innovation becomes an integral part of business processes. Modern educational development strategies are based on the concept of permanent learning and the concept of "society" [13]. Knowledge strengthens the company's competitive ability in the market. It must constantly work on knowledge dissemination, otherwise it will fall behind competition. Knowledge is developed and created by corporate knowledge, and finally, corporate memory is created. Corporate memory is defined as "information that a corporation creates, which are considered valuable for reuse" [1]. The time for which new knowledge is developing is taking place very quickly in the modern world, and this can be proved by comparing technology development alone. As a good example, which points to the rapid development in the modern world, as well as to the growth of knowledge, it is possible to take mobile telecommunication technology. When we look around and look at the stage at which the development of technology was about 40 years old. when they became commercialized mobile technologies and in which phase it is today. The success of businesses, organizations and large companies in the future will depend on management's ability to use collective wisdom, which is a set of accumulated thinking, perceptions of experience, intuition and intelligence in an organization. Knowledge is the only category that uses growth. It is an intangible good, an immaterial product that is increasingly

bound up with the driving force of the new economy [4].

III.   KNOWLEDGE AS AN IMPORTANT RESOURCE FOR BUSINESS

Knowledge is a key resource for the success of any business. Today, it often happens that the time period needed to establish a certain fact, or the establishment of a certain knowledge, is three to four times longer than the "lifetime" of the knowledge itself [13]. Using a versatile literature from different scientific fields, we have come to the conclusion that about 10% of the knowledge can be documented [6]. While knowledge acquired through different levels of education in most cases after a certain period of time is outdated. If one does not work in one continuity on the renewal of the information gathered and the improvement of the existing knowledge, our knowledge loses its value. Companies in which information is only accumulated without adopting new wrinkles at market value. In this way, the great problem is not only the increasing number of information that requires the company to create a knowledge management strategy, but also the fluctuation of employees and thus the knowledge they possess can pose the challenge that modern organizations and companies face. Success in the future will depend on the organization's ability to use collective wisdom, which is a set of accumulated thoughts, perceptions of experience, intuition and intelligence. Domestic companies have to develop a more explicit development strategy, especially in line with European and global integration flows, and the application of modern methods and techniques of management, such as quality management systems, integrated management systems, relationship marketing, benchmarking and corporate social responsibility is the basic assumption of a successful market development. Without managing change, it is not possible to adapt to changes and to effectively function and the development of each organization and every enterprise of each particular social system and society as a whole.

IV.   KNOWING KNOWLEDGE

According to Klaus Kornwachs, the deflection was defined as the abolition of that knowledge that cares, and when considering the knowledge that will be passed on to the next generations, their potential impact on the future is taken into account, in order to they have avoided recurring mistakes made in the past. In the main people tend to know what is important, and what knowledge is important depends on whether the given knowledge helps in solving a particular problem with which a person is confronted at a given moment [10]. In this case, it is a matter of knowing the knowledge, where the removal of those knowledge, whose influence can in some way negatively affect the society, or which is no longer considered necessary. In the case of obsolete and unnecessary knowledge, the removal of the knowledge of the day is carried out. And what knowledge is considered obsolete, it can vary from individuals to individuals, depending on whether the given knowledge can solve the current or future problem. According to Eric Hoffer, an American philosopher and sociologist, "the future belongs to those who are willing to learn at the time of great change, and those who think they have nothing to learn will remain crushed in a world that no longer exists" [4]. Man's need to constantly improve and expand his knowledge leads to new discoveries. The overwhelming number of information that is present can easily lead to the discovery of incorrect information that was previously believed to be replaced. Precisely uncovering unnecessary and replacing inaccurate knowledge represents the cycle of obsolescence of knowledge. Changing the world and developing knowledge requires everybody, and so on, from companies to adapt to the resulting changes. For this reason it is necessary that new skills are applied by companies and other organizations in their business.

The obsolescence of knowledge can not be stopped, because the emergence of new knowledge is not interruptible. Creating and discarding knowledge is the basis for human growth and development and new training. The psychologist, Bartlet F. C., has identified three types of changes that occur in the material learned. Emphasizing content, or remembering only a certain piece that still represents the basis of the subject, but not in its entirety. The emphasis is that some parts are highlighted, mostly parts that easily attract attention. Rationalization is the third form, and it is a tendency to make the unknown to the known, and to give rational explanations to the unclear and unknown which we can not understand [3].
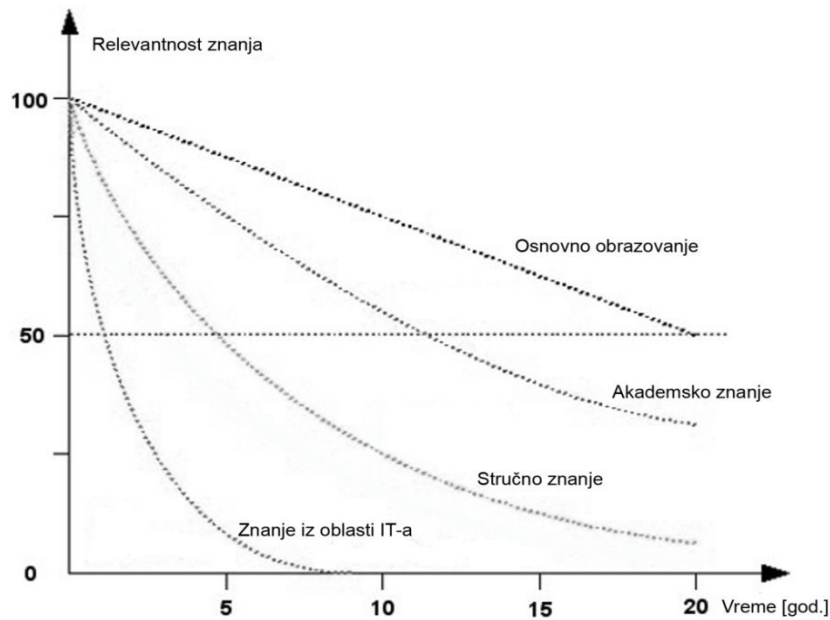
Figure 1.   Graphical representation of obsolescence of knowledge [10].

Figure 1 shows the time periods of individual categories of knowledge and their rate of obsolescence. The period of obsolescence of knowledge in the modern world, in the opinion of the author of this paper, is probably even shorter, due to the growing wave of information, but the order of overcoming remains the same.50% of the knowledge from the school is overcome for 20 years, academic knowledge about 12 years ., professional knowledge about 5 years, while it is the fastest time out of the field of IT, which can be interpreted by the drastic development that has occurred in the last years in this field. The process of forgetting is slowing down, which is also indicated by the fact that 20 minutes after the completion of learning, about 24% of meaningless syllables are forgotten, but also about 20% are remembered after 31 days [3]. When it comes to obsolescence, knowledge is not about physical obsolescence, as can be seen in other phenomena, but about new waves of information that become dominant over previous information.

The number of research papers is doubling every 15 years, and around 6 million researchers around the world are contributing to discovering new phenomena. Depending on the activity, the knowledge becomes obsolete at different speeds, although in every field there are fundamental facts that are accepted and extremely slow to change or almost none. Also, a good indicator as well as the method of measuring obsolescence of knowledge can be observation, how long after the publication of scientific and research papers, they are also cited. This is exactly the way Arbesman S. came to the following data. In the field of medicine, depending on specific areas, varies between 5 and 45 years, in the field of physics 10 years. While in the field of psychology, half of knowledge has been overcome for 7 years. [11]. How valuable is the acquired knowledge is shown by the fact that people in today's world are divided, depending on the level of education. And while investing in certain individuals in order to create human capital, the second group becomes discriminated in some form and the class division becomes even more visible [4]. The development of scientific areas and the development of the society itself creates new knowledge where it can come to the knowledge that will replace the previous beliefs about a particular subject, and pointing to the inaccuracy of earlier beliefs, the further expansion and transmission of this information ceases. This way of replacing old knowledge with new ones leads to the disappearance of knowledge. Knowledge / ignorance, i.e. whether employees have a certain knowledge or not, does not play a large role only with employees, that is, when selecting for new jobs, but possessing certain knowledge enables achievement in terms of competitiveness.

V. LIFELONG LEARNING TO BUSINESS OBJECTIVES

By improving in all life-styles, a positive effect on further development is achieved in both the private and the business world. "Intellectual capital consists of all the knowledge that employees in an organization have. Unlike real or tangible property, intellectual capital is intangible "[8]. Constant innovation makes it possible to largely positively place products in services in many market segments. By introducing new knowledge, companies become leaders in the domain of their business. In this way, it is in front of its counterparts, the profitability of business becomes bigger. Learning is the process of acquiring new information and knowledge in order to allow individuals to change their way of understanding and behavior and to successfully adapt or influence their environment [9]. It is also very important during schooling in order to avoid

obsolescence of knowledge, apply one of the dual education. It is necessary to synchronize theoretical knowledge with practical knowledge in the real sector. If business success is to be achieved, it is necessary to develop the interaction of school institutions with business entities. The basic goal of introducing dual education is to help the school system to educate personnel who are really needed by education. The main purpose of introducing such a program in education is reflected in the motivation of both students and business subjects to include only qualitative staff in their ranks. As an advantage of introducing dull education, we can also indicate a better business result, a wealth of diversity and diversity, improvement of business skills, greater satisfaction, increased work discipline, more efficient decision making, as well as improved communication and information of students themselves and business subjects [16].
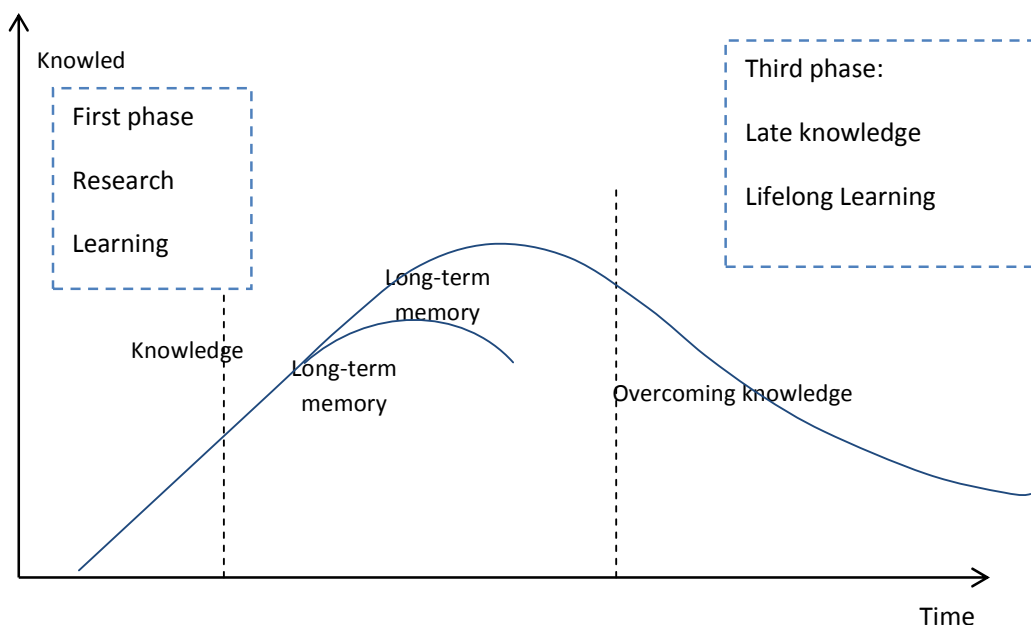
Figure 2. The curve of changes in knowledge development

Figure 2 shows a simplified flow of knowledge, is, Changes in knowledge development. Since the knowledge of knowledge is closely related to the phenomenon of forgetting, it is not possible to separate them separately. The first phase involves the identification of the lack of information, followed by research and search for the necessary information. This phase will turn into the state of the acquired. By acquiring knowledge, a critical point arises, from which depends whether the knowledge will go into the

phase of long-term or short-term memory, which represents the second phase. What will be embedded at this stage depends to a large extent on what was done at the previous stage. In order to keep this phase of memory as long as possible, you need to know how to learn in order to remember the subject for as long as possible. In the third phase, a situation arises where the knowledge that has been adopted, in the long term, will be overcome at some point.

VI. CONCLUSION

The aim of this paper is to present the influence of the obsolescence of knowledge of business skills on the failure of the companies' operations and their positioning on the market. Innovation, flexibility, team vision, a strong desire for change will enable the company to achieve business excellence and become an absolute leader in the market. If new knowledge is not adopted in a large number of cases, skilled personnel will be obsolete. In the human capital it is necessary to invest, it is necessary to create an organizational climate that will stimulate all employees for constant education and further training. By adopting new employee knowledge, the company enables high positioning and business success is becoming a business success. Precisely uncovering unnecessary and replacing inaccurate knowledge represents the cycle of obsolescence of knowledge. Changing the world and developing knowledge requires everybody, and so on, from companies to adapt to the resulting changes. For this reason it is necessary that new skills are applied by companies and other organizations in their business.

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Applied European and National Interoperability Framework in the Development of Egovernment to the Republic of Serbia

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Abstract - The European Commission defined e-government as "the use of different information technologies, organizational changes and new skills in public administration, so that public services can improve and strengthen democratic processes". It is reflected in the inability to document exchanges and establish a connection, which consumes the time and opportunities that exist. According to the European Commission, "the interoperability of the ICT System, the division and re-use of information and processes in the public sectors is crucial for high-quality, innovative, citizen-centric e-government". In order to provide public services that are tailored to the needs of both citizens and businesses, fast and efficient information transfer at the state administration level is necessary. It is precisely this goal that has interoperability, which can be defined as "the ability of information and communication technologies and business processes that support, share data and enable sharing of information and knowledge". [1]
In this paper, the basis on which the electronic administration is based on interoperability at the international and national level are presented. Also, documents that legally corroborate the validity of the introduced newspapers are highlighted.
Key words: EIF, NIF, Electronic Administration, Web services

I. INTRODUCTION

E-Government (e-government, e-government) is based on the digital interaction between government and citizen (G2C), government and enterprise (G2B), government and employees (G2E) and mutual governance of various countries (G2G).

In order to provide public services that are tailored to the needs of both citizens and businesses, fast and efficient information transfer at the state administration level is necessary. It is precisely this goal that has interoperability, which can be defined as "the ability of information and communication technologies and business processes that support, share data and enable sharing of information and knowledge". [1]

ICTs are undoubtedly prevailing in all aspects of business, and this form of administration is no exception. It represents progress in state development and facilitates communication at different levels. For this reason, digitization is one of the priorities in taking development measures.

II. EUROPEAN INTEROPERABILITY FRAMEWORK (EIF)

The European Interoperability Framework is defined by a set of acts, standards and recommendations that describe the way countries agreed or should agree in order to establish functional co-operation. The purpose of the European Interoperability Framework is:

- Promotion and popularization, in support of European public services through the promotion of interoperability between the borders of the states and between different sectors;
- Guidelines in the effort of public administration in order to provide European public services to citizens and businesses;
- Enabling compatibility and merging of different National Interoperability Framework (NIF).

The European interoperability framework can be viewed from different perspectives, so it can be said to include the following layers: political, legal, organizational, semantic and technical.

The basis of the EIF is that each state has or is in the process of developing the National Interoperability Framework, so that the EIF gives

priority to the addition, rather than replace the National Framework, which gives it a pan-European dimension. [4]

EIF was of particular importance for the development of e-government in Serbia because NIF was not adopted in the Republic of Serbia for relatively long time, until January 10, 2014. Development of eGovernment in the Republic of Serbia is based on the Strategy and Action Plan for eGovernment Development by 2013, while EIF is the only document related to the interoperability of eGovernment. According to these documents, the concept of eGovernment in the Republic of Serbia began to be realized when an access point for citizens and business users, or a national eGovernment portal, was enabled. Business processes supporting eGovernment services are performed on this portal and exchange the necessary information and information from other public authorities directly through web services. From the significant degree of interoperability in the development of the electronic administration of the Republic of Serbia, data and information has not been achieved so far through the web services to a satisfactory level.

The interoperability of eGovernment is equally important for the governments of the member states of the European Union, as well as those that tend to become so. The concept of interoperability is reflected in the acceptance of standards and architectures. Standards are provided by the eGovernment Interoperability Framework, which is a set of standards and policies that the government uses to specify the way in which the public sector, citizens and partners interact. The GIF includes a technical specification that every public sector involved in eGovernment needs to adopt. These standards relate to:

- Organizational interoperability of business processes;
- Informational or semantic interoperability;
- Technical interoperability;

The definition of a European interoperable framework can also be specified as: "The interoperability framework is an agreed approach for organizations that want to work together on a unified public service delivery." Within its application, it defines a set of common elements: dictionaries, concepts, principles, guidelines, recommendations and practice. "

The European Union's interoperability strategy is based on the European Interoperability

Framework (EIF). European Interoperability Framework is represented in Figure 1. A common approach to interoperability with the vision to make it possible to adapt public services in Europe by 2015:

- Adequate government organizations and processes in accordance with the objectives of the European Union;
- Safe exchange of information that is achieved by agreement on rules and standards;

Interoperability refers to co-operation in the public administration, exchange of information in public sectors, which leads to improvement of services and reduction of costs in carrying out such tasks.

EIF defines a conceptual model that describes the principle of organizing European Public Services, which allows interconnection and reuse of components when building new services. Also, the EIF shows 12 important principles:

1. The first principle sets the framework for joint action in the field of European Public Services (1st Subsidiarity and Proportionality);
2. The second principle generates users' needs and their expectations (2. User Centricity 3. Inclusion and Accessibility 4. Security and Privacy 5. Multilingualism 6. Administrative simplification 7. Transparency 8. Protection of information);
3. The third principle sets the basis for collaboration between public administration (9. openness 10. Reuse 11. technological neutrality and adaptability 12. Effectiveness and efficiency).
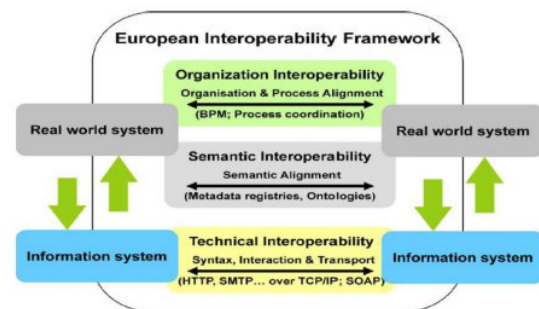
Figure 1. Graphic representation of the European Interoperability Framework [2]

III.   CONCEPTUAL INTEROPERABILITY MODEL

European public services are based on data and information, which are at different locations and levels in the administration, in different countries.

In addition, they combine basic services that were built independently of public administration in different countries.

For this reason, the conceptual model is based on the fact that it is necessary to provide modularity, loosely connected service components linked through the appropriate infrastructure, so that all together perform the job and provide European public services.

Recommendations concerning the conceptual model indicate that "public administrations must agree on a common scheme for linking components and building the necessary infrastructure in the implementation of European public services." Such a model is shown in Figure 2.
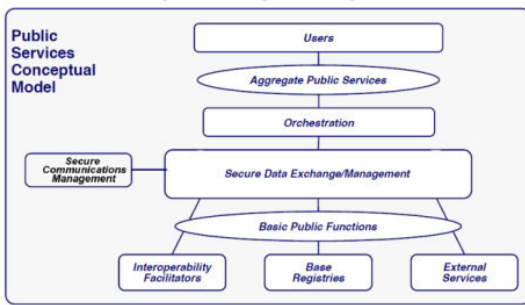
Figure 2.The conceptual model of interoperable public services [3]

IV.   REALIZATION OF INTEROPERABILITY IN EGOVERNMENT IN THE REPUBLIC OF SERBIA

Electronic government in the Republic of Serbia can be viewed as a system that has one entry point for all eGovernment services. This portal allows interconnection with the Ministry of Interior between GSB and ESB services, as shown in Figure 3.
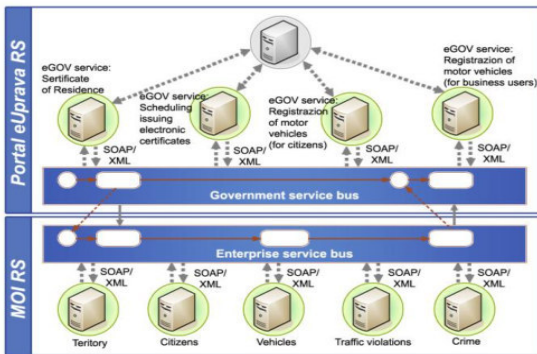
Figure 3.Implementation of interconnection between GSB and ESB services [4]

Implementation of the GSB would provide:

- platform for high level of interoperability of information systems of public authoritiesRepublic of Serbia; platform for standardized integration of public authorities of the Republic of Serbia;
- Safe exchange of information between public authorities of the Republic of Serbia;simple registration of services on the eGovernment portal.

V.   NATIONAL INTEROPERABILITY FRAMEWORK

The Government of the Republic of Serbia has adopted the National Interoperability Framework (NOI) 10.01.2014. and its goal is to harmonize business processes within and between state administration bodies.

NOI is established in accordance with European public service practice, respecting the security policy, privacy, preservation and archiving of public services and electronic records. NOI complies with the European Interoperability Framework (EIF) version 2.0.

Although the EIF is primarily concerned with securing the Pan-European dimension of interoperability, it also plays a major role in ensuring interoperability at the national level. In this way, interoperability with the EU Member States is ensured at the same time.

Therefore, it can be concluded that the NOI is a document of the policy of the state administration body that defines the rules and manner of using interoperability in the Republic of Serbia. It defines possible common infrastructures and services, which can contribute to easier interaction at multiple levels, as well as possible re-use of applications and information.

Apart from the fact that the National Interoperability Framework takes into account the recommendations of the European Union (EIF to 2.0), the technological capacities in various state administration bodies, the existing electronic services in state administration bodies, the application of open standards and applications are widely used among citizens. [5]

NOI is also a way of promoting international cooperation, which is known as inter-state interoperability, which helps in building the infrastructure necessary in solving cross-border problems.

Figure 4 shows the levels of interoperability, which represent the custom version of EIF v2.0.

Figure 4: Interoperability levels [5]

VI. CONCLUSION

By adopting the National Interoperability Framework of the Republic of Serbia, guidelines have been established for the establishment and implementation of interoperability in the state administration bodies in the Republic of Serbia and it is precisely in this respect that its importance is reflected. The aim of the Republic of Serbia is to improve electronic services for all citizens, to effectively and efficiently provide public services, facilitating interconnection at all levels of administration. Such an improvement can be achieved through the implementation of the National Interoperability Framework, developed in accordance with the European Interoperability Framework.

In the near future, the full integration of the information needed by the users of electronic administration is expected, which is a relief in the way of doing business. For this reason, compliance with recommendations and standards at the international level represents a shift in the modernization of public administration.

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Informal Learning of IT Students

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Abstract – As a part of a lifelong learning, informal learning represents significant way of gaining knowledge and education. Many of its forms are included in the habits of young people/students and because of that informal learning becomes very significant contribution to the formal and non-formal education.

This paper presents students point of view considering informal ways of learning, especially, information technology (IT) students. It expresses forms of informal learning recognized by the students. As such, this work may be used in further research that will include particular tools and methods and enable significant results in this area of expertise.

I.   INTRODUCTION

It is known that people may have formal, non-formal and informal education. Its relation is presented in the figure 1.
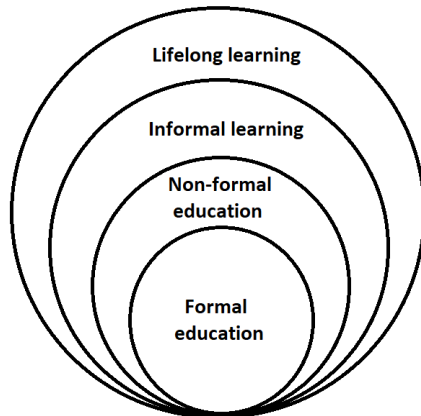
Figure 1.   Relation between types of education [1]

People have formal education in primary and secondary schools and during higher education. This type of education makes educational system of every country. Because of its official rules, programs, standards and certificates it is formal education, recognized all over the world. Non-formal education people may have through non-formal institutions, apart from the formal educational system (for example, thru courses, specialized schools, etc.). [2,3]

Informal education is every other way of learning that may be conscious or unconscious, planned or spontaneous, systematic or disorganized; that is present in every moment of our lives. This is very important for young people, particularly students because it is in accordance with their way of living and habits that they have nowadays. [2,3]

In this paper, authors put an emphasis on informal learning and try to explain its significance from students' point of view. Forms of informal learning are presented in this paper, together with their main characteristics and reasons that students have for using them.

II.   FORMS OF INFORMAL LEARNING

As it was said before, informal education is every other way of learning apart from formal and non-formal education. Students would say that, because of its characteristics, it represents wise, respectful and spontaneous process of cultivating learning. It happens through conversation, joining groups that are learning the same things and even looking for answers on the Internet.

Beside many ways of informal learning, the most important factor for this type of learning is our will to learn and extend our knowledge. It influences on motivation to learn and learning productivity.

Informal learning enables more relaxed atmosphere that is often more personal and less intimidating, and it invites the learner to be active in the learning experience. Also, its content is less structured and rarely instructor-led.

Considering informal education of IT students, it is more or less the same as of any other student, but because of its forms, it may be more suitable and easier for IT students. The most usual ways of informal learning are:

- Through conversation;

- By using internet;

- By exploring and enlarging experience spontaneously.

1. Conversation is considered to be very important way of informal education. It is driven

by talking to and being with other people. Sharing experience, getting deep into the topic, consciously or unconsciously learning and expanding knowledge are the consequences of the conversation. Figure 2 illustrates sharing and expanding knowledge through conversation.

Sometimes, learning through conversation is done on purpose, but more likely people are not aware that they are learning, which is even better.

Figure 2.   Sharing and expanding knowledge through conversation [4]

During their studies IT students are engaged in many projects and usually work in teams. This put emphasis on conversation as a very important way of collaboration. At the same time, learning process happens as well.

Students, who are in the process of learning, sometimes think that reading scripts and listening to professors is not enough for them. By searching for answers, they usually ask older students who passed particular subject for help. Getting other people opinion is recognized by students as important factor in learning and expanding knowledge.

As well as talking and listening to others, people also have conversations with themselves. People talk and think about the things they done or doing. Thanks to that kind of internal conversation they create new ideas, reconsider them, and find the answers eventually.

2. Internet – We are living in the XXI century, where everything is going really fast and people try to save time as much as possible. While in the past, IT students that did not know how to solve some problem often used to look for the answers in books, without even knowing if the solution is in there, nowadays Internet represents fastest and the most suitable way of learning.

In previously described case, when students have difficulties to solve the task, it is more probably that they will look for the answer on Internet rather than asking professors themselves. They usually have a fear of asking "stupid"

questions and because of that they turn to Internet, the place where they cannot be judged for that.

Internet has numerous forums that are excellent in helping students about their problems, especially in case of programming (Figure 3 illustrates the way of using Internet for informal learning).

Forums may be good for learning and sharing experience too. There are millions of topics and a lot of people who are writing and sharing, which looks like learning trough conversation but in this case it is done online. It is usually easier to find someone online who knows answers than asking people in person.

What is the most important in this form of informal learning is that students do not need to look for the answers in the "big" book, they simply put in the key words of their problem in browser, and Internet finds answers for them. That saves a lot of time and makes learning much faster.

Figure 3.   Using Internet for informal learning [4]

There are numerous high-quality courses on the Internet that help students in learning process, but most of them cost a lot of money. Students who want to learn in that way are often satisfied in the end. In case that the price is too high they are focused on finding answers themselves which has its pros and cons.

Also, there are many video tutorials on the Internet (YouTube), and students genuinely like watching videos more than reading, because they are more focused that way. This is why visualization in education and learning plays an increasingly important role.

Previously discussed suggests why Internet is the best form of informal learning today.

Statistical reports show that informal learning represents more cost-effective way of learning and learning outcome is greater because students are

using their own sources and learn their own way. Histogram in the Figure 4 illustrates relation between learned and spent percents for formal and informal learning.
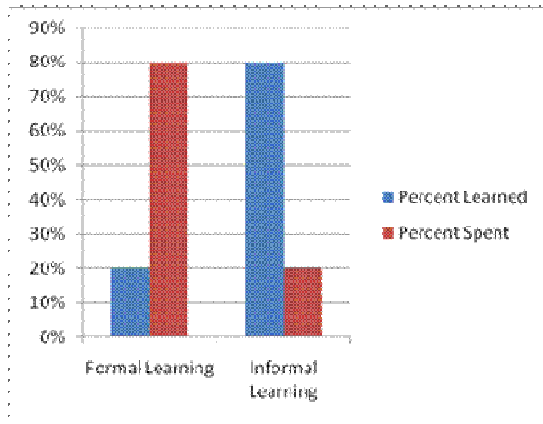
Figure 4.   Relation learned/spent percents for formal and informal learning [4]

3. Exploring and enlarging experience through spontaneity – In cases that students do not use previous two methods for resolving their problems they try to find solution by using its own methods, simply trying.

That represents one of the hardest ways of informal learning, because it is time consuming and, from students point of view, it is harder to figure problems out using just our logic than asking for help or looking for it online.

But there is one big pro for using this method – students who learn like this often think much more and use their brain and logic more than students who just watch videos. This method is sometimes called "Going with the flow" or "learning from mistakes" (Figure 5) and it is much more efficient, because when student finally find the solution, it will be always in his memory because he/she figured it out by him/herself.

This way of learning can be really hard and frustrating because students often lose hope and motivation after few problems that appear in the process of finding solution. This emphasizes the role of motivation in education and learning altogether.

Even though this way of learning is one of the most efficient ways, it is the least used comparing to other forms of informal learning.

The common thing for all forms is students' will to learn, to progress and extend their own

knowledge. When that is achieved, everything is possible and much easier.

Figure 5.   Learning by our own way [4]

III.   CONCLUSION

This paper presented forms of informal learning and their importance from the aspect of IT students' observation. There are: conversation, Internet and exploring and enlarging experience spontaneously.

Particular attention was paid to the Internet as the most accepted form of informal learning. Information technology students are familiar with the importance of the Internet in the process of acquiring knowledge that can be a major contribution to formal and non-formal education, i.e. to lifelong learning. This way of learning is in accordance with life habits that young people have today and may be one of the most suitable ways of learning.

This paper may be the basis for the further research that would include creating special tools and methods for acquiring empirical material of students' habits in informal learning.

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Realization of Multilayered Software Architecture in Complex Informational System

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Abstract - The paper presents advantages and application of layered software architecture in the practical realization of one information system, both its functionality and so on
the logical structure and role of each layer (Data Access Layer, Domain Layer, Service Layer, Presentation layer) in logical hierarchies and practical implementation.
The function of each layer in the hierarchy is described in particular services that the lower layer provides the layer directly above. At the end image of the complete layered architecture is displayed and described with all the layers as a whole. Conceptual Application Diagram (CDM) shows the conceptual model of the practical information system, its entities and the relationships between them, on which is practicalaly applied layered software architecture that is the subject of this paper. By the practical realization of layered software architecture in shown information system there are many advantages over a single-layer architecture, which is
detailed in this work.

I. INTRODUCTION

Software architecture represents a description of the subsystem and the components of the software system and the relationship between them [1].

Choosing the right architecture is one of the most important decision that must be made at the planning stage of software development. If it's a small application, storing business logic, data and presentation logic in one layer can be quite acceptable and it is Layered architecture may seem inappropriate and unnecessary. However, how is the complexity of the application is growing, layered architecture is one of the better practices to achieve a loosely coupled code which enables easier maintenance and testing of software [2]. The system can be broken into subsystems in the analysis due to the size or complexity of the system.

Information system which layered architecture is shown below thru hierarchy of the layers is complex organizational system, and complexity it also applies to the structure of the elements and the structure connection both within the system and with the environment.

Subsystem analysis can be considered in the course of design due to coherence and compatibility with a complete architecture of the system. Subsystems resulting from separation must have clearly defined boundaries and well-defined interfaces, i.e. good encapsulation so that they do not change if other subsystems in the environment are changed.

Main advantages of layered architecture:

- Forming smaller units in development.
- Helps to maximize reusability at component level.
- Helps designers to deal with complexity.
- Helps code maintenance.
- Adds portability.

The idea of layered architecture is based on being conceptually different parts applications implemented separately, with the layers at a higher l levels of abstraction only use the services of the lower layers.

II. UML DIAGRAM OF CONCRETE INFORMATION SYSTEM

Advantages and realizations of practical application of layers architecture is represented by the implementation and realization of business information system for management and storage of finished products.

Data models allow modeling semantic and logical system structures. Usually modeling begins with a conceptual data model - CDM to help with analyzing the system.
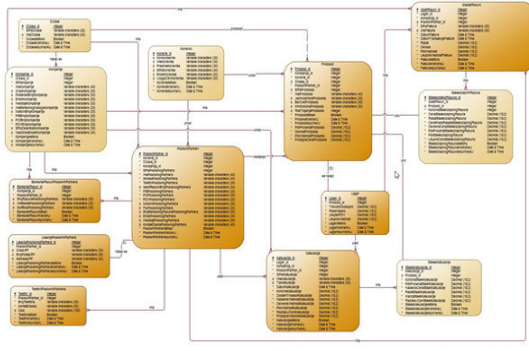
Figure 1. Conceptual diagram (CDM) of the information system

Conceptual diagram of the application of finished products warehouse shows 13 entities (with attributes that describe them) that are related exactly by defined relationships. Entities of this application are:

Countries, Companies, Users, Business Partners, Bank accounts of business partners, Locations of business partners, business partner phones, Products, Lager, Calculations, Calculation Items, Outgoing accounts, Outgoing account entries.

The main task that should be addressed is this the information system is collecting, archiving, analysis and processing of collected data in information, for their transformation into knowledge for the specific (business) purpose for the warehouse of finished products, which includes: reception, storage and distribution of finished products. From The displayed one shows that the mentioned solution represents a complex organizational system as which is noted in the introduction of this paper.

Architecture description in further work is shown through creating part of the product in this information system.

III.   REALIZATION OF LAYERED ARCHITECTURE

The layered software architecture consists of 4 layers, arranged in 4 folders, which represent the tree of layered software architectures and contain the following projects:

1. Data Access Layer contains a project *Repository,*
2. Domain Layer contains a *Domain* project *,*
3. Service Layer contains *Service* project *,*
4. Presentation Layer contains a presentation part of the application - intefejs.

It is necessary to link projects by adding mutual references between layers, such as:

- The presentation section contains references to Projects Domain, Repository and Service,
- The Service project contains a reference to Projects Domain and Repositories,
- The Domain project has no reference to others projects because it is managed directly by the Entity Framework that map objects to database,
- The Repository project should contain reference to the Domain project.

A. *Domain Layer (Domain Model)*

Figure 2. Structure of domain layer

Architecture goes from the Domain project where it is stores the domain application model that contains the structure class with their properties and the reference to the Entity Framework.

B. *Repository layer*
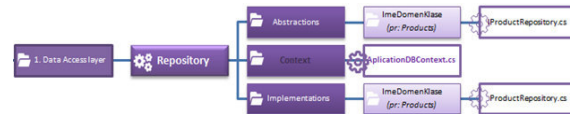
Figure 3. Structure of repository layer

Repository layer is designed to access the databasedata. It should also contain a reference to EntityFramework to "communicate" with database. This layer implements the following structure and functionality:

- Abstractions - contains abstractions, interfaces, to access the database,
- Context - contains the EntityFramework context for mapping to a database,
- Implementations - contains implementation interface and using the context-based access database data.

C. *Service layer*
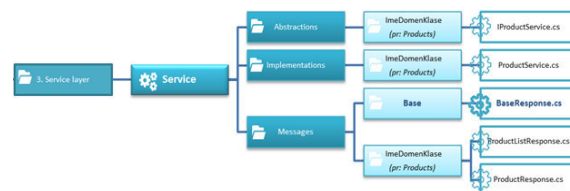
Figure 4. Structure of service layer

The service layer serves as a link between the user interface and the rest of the application. Inside it places logic at a higher level of abstraction and captures errors that occur when application is running. This layer is formed from the following sub-hierarchy with functionalities:

- Abstracition - contains service interfaces,
- Implementations - contains implementation interface,
- Messages - contains feedback messages that the interface returns the application.

D. Presentation Layer
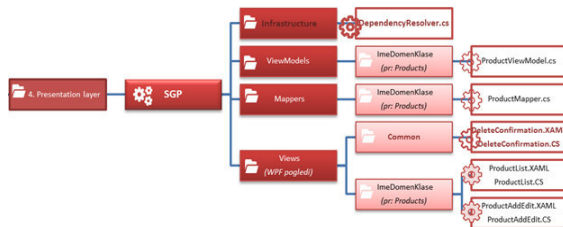
Figure 6. Structure of presentation layer

Within the main project it is necessary to add a reference to Ninject which represents a container for Dependency injection. This layer is the next logical structure and implementation:

- Infrastructure - DependencyResolver, which represents the connection between the interfaces and their implementation within the entire project,
- ViewModels - this part consists of classes that contain data displayed on user interface through views,
- Mappers - make up the classes in which they are impementation methods they translate instance objects from ViewModel to Domain model and vice versa. Mapers use a layer Service when calling the Repository layer method (mapping the ViewModel to the Domain model), as well as when returning the Repository response layer (mapping Domain Model to ViewModel).

Part of the layered architecture containing the presentation logic, views, or implementation user interface:
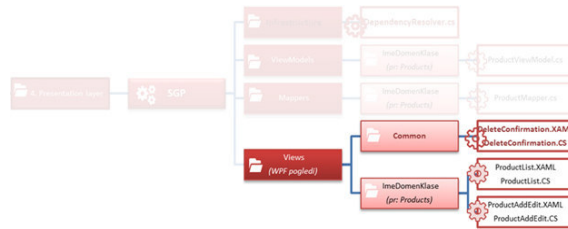
Figure 5. Presentation layer structure (views)

- Views - Appearance of the application, views with class for implemenation of the background code of user interface.
- Common - contains common views on new entire application like the dialog for display confirmation of deletion of a particular object from system and implementation class background logic.
- The last folder in the description of the hierarchy contains main user interface for displaying all objects with a class that needs to Implies the background logic as well view to add and edit.

E. Display all layers of the software architectures information system
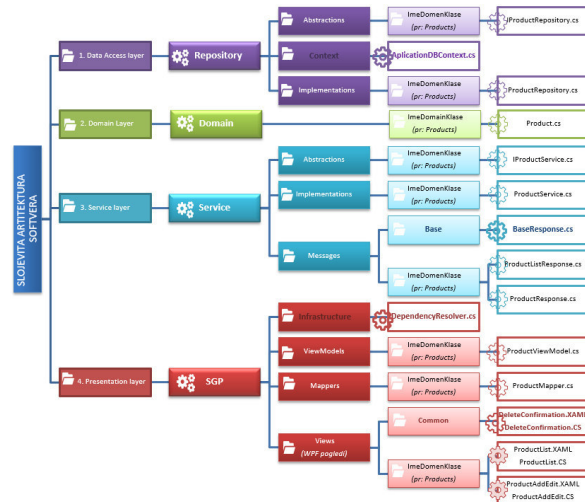
Figure 7. Overview of layered arhitecture as a whole

The previously described layers as a whole with their functionalities together make layered architecture software where each layer communicates with the layer below, i.e it provides a service layer above in the logical one hierarchies, while each of them executes their own functionality and represents a separate entity that does not knows the works of any other layer in the hierarchy, which illustrates the picture above.

IV. CONCLUSION

As it is in development and description of concrete implementation of the hierarchy shown, layered architecture decomposes the application into more abstract classes, where each level represents one a layer containing a task group (method), identifies the main structural components of the system I Relationships between them allow for representation high-level system, affects the performance, robustenes and maintenance of the system.

Layers are hierarchically arranged so that each layer provides services to the next higher layer in the hierarchy. Services in one layer are implemented using services which provides the first lower layer in relation to the observed.

ACKNOWLEDGEMENT

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The Risks of Pupils on the Social Networks

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Abstract - Risks for pupils on the Internet and social networks are getting more diverse and more frequent in modern society. Therefore, considering the value and educational potential of the Internet, which are probably not exploited enough, should not be ignored dangers and risks of using the Web, in order to focus the attention on protecting and ensuring safe usage of these ways of communication. The authors of this paper are analyzing the risks of pupils as social networks users in Republic of Serbia. The results of the research show that there is a certain perception among pupils about the risks and dangers they are subject to on social networks, but that most of the pupils are not familiar with the ways they can protect themselves and that they need institutional help for that.

I. INTRODUCTION

Internet and mobile communications have become an indispensable part of the active time for many children aged 7 to 18 - within the households, in educational institutions, in peer groups, etc. Spreading the Internet as free information space and the expansion of social networks also bring along some potential risks for children. Whether these risks are related to social networks dependence, misuse of personal information, Cyber bullying or other risks, there is a need that all included, children, parents and teachers should be trained for secure use of virtual space.

Children are nowadays living in technological environment in which they have an easy access to the social networks, both in their homes or via personal mobile phones. The data point to the fact that the Republic of Serbia, in the true sense of the word, has become an information society.The social networks has become the most popular media among children in a relatively short time. Children are easily affected by this media because they gain knowledge from the field of Computer science early.

A special attention is directed to the safety of children on social networks. In fact, four-fifths of the children aged between 10 and 18 have a profile on some of them.[1]The first social networking site was SixDegrees, created in 1997, then Ryze (2001), Tribe (2003), LinkedIn(2002), Friendster (2002), Myspace (2003) and Facebook

(2004).Facebook, Twitter and Myspace are only some of the most popular social networks in the Republic of Serbia. [2]

Some recent researches have shown that social networks and communication with peers and peer groups is a dominating activity for twelve-year-old children while for 70% of those from 14 to 17 years of age the Internet represents a daily activity. In the same time, 99% of American teenagers have their Facebook account [3] unlike the situation from five years ago when 85% of them prefered Myspace. [4] Moreover, some researches in the USA have proved that out of the total number of teenagers who have several profiles on various social networks, 99% also have Facebook profiles and if they have only one profile, in 89% cases it is Facebook profile [5]. Research in Europe, by author Livingstone, shows that social networks are very popular among children and adolescents in Europe. Moreover, it seems to be their favorite Internet activity, as 77% of children aged 13 – 16 and 38% children aged 9 – 12 have their profiles on social networks. [6] Facebook is the most popular social network in seventeen out of twenty-five countries that participated in this European study. [7] Also, in the study, gender differences in the use of social networks were not significant (60% of girls and 58% of boys have a profile).

II. THE RISKS OF USING SOCIALNETWORKS FOR PUPILS

The risks for childrenaged 7 to 18-users of social networks are becomingmore and more versatile and frequent in modern society. Adequate and efficient measures are necessary to be taken in order to protect children[8], so numerous legal acts and regulations have been adopted   both in international and national laws.

A. *The Risks of Using Social Networks for Pupils*

The expansion of social networks has provoked some new polemics on advantages and risks of new, virtual communities for children's development.Some theoretical sources emphasize that social networking can contribute to the

development of creativity, self-efficiency, different academic achievements, self-confidence, tolerance to diversity and social skills but it also exposes them the risks of violence and misuse. [5] Generally speaking, social networks bring various advantages to children, e.g. they can be used in education, [8] both as teaching tools and context (virtual classroom).[9] However, some experimenting with identities via social networks can have numerous negative consequences. Certain risks are present and the exposure of children to disturbing contents is obvious. Many risks from physical reality have been moved to virtual environment, so the children in the social network environment can face with different negative aspects of interpersonal communication with their peers and adults. For all these reasons, a special attention must be paid to children's security on social networks.

However, given that exploiting and abusing children for pornographic purposes, as well as data privacy, have been recognized as main risks of children using the Internet, the work of entities that are dealing with other risks on the Web has been marginalized.[10] During 2006, in the USA, out all of sexual offences committed over the Internet in which the victims were juvenile, 33% were carried out on social networks (2322 cases). [11] Some authors say that a fear regarding the use of social networks for sexual crimes is unjustified because chat rooms are used as means for committing this crime.[12][13]On the other hand, it is worrying that children, the Internet users, give their personal information to strangers.According to the results of recent European studies, children on social networks most often leave the following information: in 50% of the cases they reveal their personal information, [14], in 79% of the cases they post their own photographs, in 66% of the cases they post photographs of their friends, in 41% of the cases they reveal the name of their school, in 29% of the cases they leave their email address and their full name [15], and one third of users share their password with their friends. [16]Possible consequences of posting personal information on the Internet can bring undesirable contacts out of the network, which can further bring the child in real, physical danger. Other authors say that it was not empirically confirmed that leaving personal information on the Internet was in direct connection to victimization because other types of risky behaviour were also included.[17] However, risky behavior on the Internet also includes other risks for the children

on the Internet and social networks. Also, Internet and social networks could be used for violence promotion.

Another problem is a social network addiction as a type of Internet addiction which is caused by the increased time spent on social network sites.[18] Recently, this type of addiction has become an important research subject both worldwide [19]and in Republic of Serbia. [20]

Cyber bullying, grooming and sexting represent the types of violent behavior that endanger children's rights. *Cyber-bullying* exists when a person or a group of people uses the Internet, mobile phones, online games, social networks or any other form of information communication technologies (ICT) in order to threaten, harass or humiliate another person. *Grooming* is a process in which children are persuaded or encouraged to participate in interactions of sexual content via the Internet or phone devices, whereby they are exposed to unwanted pornographic contents.*Sexting* represents sending disturbing contents(explicit texts, photos, videos) via ICT to another person (most frequently via SMS, MMS, e-mail, Facebook, Myspace and other social networks and chat-rooms. Based on the research carried out by the Provincial Ombudsman, data were received from the police departments (PD) in Autonomus Province of Vojvodina (APV), i.e. from the police stations on their territory, about the number of reported, denied and processed cases during 2011 and 2012. The data shows that two cases of child exploitation on the Internet were reported on the territory of PD Zrenjanin.One case was about cyber-bullying, where inperpetrators were children and the other case referred to sexting. [21]

The harmonization of the Republic of Serbia legislation with the European Union (EU) is in progress, within the process of accession of the Republic of Serbia to the EU. Republic of Serbia has established a special service responsible for combating high-tech crime within the Ministry of Interior, as well as the Special Prosecutor's Office for the Fight against High-Tech Crime, ratified the Council of Europe Convention on High-Tech Crime and largely aligned with the Directive 2013/40/EU of the European Parliament and of the Council of 12 August 2013 on attacks against information systems replacing Council Framework Decision 2005/222/JHA.[22] In addition, it was concluded that further amendments to the regulations are necessary in order to fully align

with the EU, in the *acquis communautaire,* in this area.

B. Research into the Republic of Serbia and the Europe

While in the world, and especially in the EU, research on Internet risks related to children and their protection on the Internet are very numerous and frequent, the first more systematic research of this type related to children in the Republic of Serbia was realized in 2012, at the Institute for Psychology University in Belgrade with the support of UNICEF and Telenor. The research was based on a survey and it included 34 schools (17 elementary and 17 high schools), i.e. 3786 pupils, 3078 parents and 1379 teachers. Women were more prevalent among parents and teachers.According to the survey data collected, 62% of older elementary school pupils and 84% of high school students were exposed to risks in cyber space in 2012.[1] Based on this research, it was determined that the most widespread risks are: accepting friend requests from strangers (43% of elementary pupils, 71% of high school students), sharing personal information on profiles (29% of elementary pupils, 39% of high school students) and responding to messages from strangers who want to get in touch with the child (27% of elementary pupils, 47% of high school students). [23] It can also be noticed a higher readiness of older children to meet in person with the people that they get to know on the Internet.

Newer research shows that social networks and communication with peer groups and peers become a preoccupation as early as at the age of 12, and as for those between 14 and 17 years of age, it is an everyday Internet activity for 70% of the generation. [24] This research was initiated by UNICEF with support of the Government of Great Britain, and realized by Ipsos Serbia.In the second half of 2015, the Republic of Serbia joined the *Global Kids Online* International Kids Online Survey, which includes a total of 5 countries together with UNICEF Research Innocenti Research Office in Florence, with the support of the government of the United Kingdom. Consequently there are Internet risks, and the exposure of children to disturbing content is evident.

Children's computer skills represent an important factor for their security protection in the Internet and while accessing social networks. It is related to their familiarity with privacy security and the risks they could be exposed to on the Internet. A research in Europe has shown that digital competence is better at an older age and that boys are slightly more competent.[25][26]It has also shown that children from Finland, Slovenia, Holand and Estonia are most competent. However, it is considered that along with the improvement of competences, experience and the time spent on the Internet the users' consciousness also improves and they become aware of potential risks, so their capacity for protection rises as well. [27]

Today, almost all EU countries have filters installed in computers to prevent children from accessing pornographic sites. The EU has also advocated controlling illegal activities on the Internet by increasing the number of Internet users. With the Decision of the European Parliament 854/2005/EC of 2005, the Internet Safe Plus program was launched, which aims to ensure the safe use of the Internet and new tehnologies especially for children. In Germany the Bundestag has passed a law allowing providers to block sites with child pornografy.

III. METHODOLOGY RESEARCH

In order to measure the attitudes of pupils in the city of Zrenjanin in 2017, research has been conducted. The research topic is the attitudes of pupils concerning their safety on the Internet and social networks, that is, their perception of the need for implementing protective measures on the Internet and social networks. The research goal is to establish the opinions and behavior of the pupils in context of the new life environment and to be aware of the necessity of their own personal involvement in it, in order to prevent its negative effects.

The quantitative method which was used to carry out the research is a survey in a narrowsense, about attitudes and opinions of the examinees' pupils. Conducting of this quantitative research enabled precise measuring and quantifying of the relevant indicators. The value of this survey is limited because the information received in it depends on honesty of the examinees' pupils and their ability to answer fairly to the questions asked. It is possible that the survey method is subject to epistemological and social limitations, in the sense that the examinees do not answer how they really mean, but according to the social values or their unawareness of the matter. That is why a survey is considered only as one of the phases in the research process, without neglecting other aspects of the research.

The information collection technique is an indirect survey, or a questionnaire in paper with 15 mostly close-ended questions, the first three being personal information about the subject. It is detected here whether the pupil has a profile on social networks. The following questions are related to the behavior of the pupil, that is, the type and frequency of computer and social network use (internet access, the position of the computer, the time, frequency and length of computer and social network use). Then, the type of the pupil's internet activities is assessed (studying, games, movies, music, social networks...). A set of sensitive questions follows. The pupils are asked if they leave any personal information on social networks, and whether they consider leaving this information to pose any risks. In addition, they are asked if they ever had any unpleasant experiences on the Internet and if they were upset about it. The core of the survey are the questions about the pupils' attitudes on whether they consider themselves to be sufficiently acquainted with the ways of safe Internet use, and if they are equipped to handle any kind of problem of this type. Also, what specific things they do to protect themselves, and if they feel they need institutional support in that field. In addition, the pupils are asked if they are familiar with the legal and institutional framework of Internet safety.

The questions were closed-ended with the simplest form of YES/NO answers, as well as with one or more offered answers. There was also given a possibility to write additional answers which were not offered, but a pupil found them true.

IV.   RESEARCH RESULTS

The research was based on a survey and it included 2 elementary schools, i.e. 156 pupils. The research shows that social networks and communication with peer groups and peers becomes an Internet preoccupation at the age between 14 and 17, being, for 59% of the examined pupils, an everyday Internet activity.

As mentioned before, a part of the survey was about whether they've experienced any unpleasantness on the Internet and social networks. A huge percentage of the pupils (no less than 57%) said that they've had an unpleasant experience on the Internet, and 20% of them said that they haven't experienced any kind of unpleasantness. 23% of the pupils chose some of the options about having an unpleasant experience on the Internet and social networks, and only 20% connected that declaration to the following question which asks for a statement about the unpleasant consequences of Internet and social media bullying, that is, whether they were upset after the experience.

According to the survey data collected, 57 % of elementary school pupils were exposed to risks in Internet and social networks in 2017. Based on this research, out of the 8 types that were offered, the most frequent ones are: personal information abuse (32% of elementary school pupils), meeting an unknown person in real life (31% of elementary school pupils) and experiencing verbal abuse and belittlement (17% of elementary school pupils). It can also be noticed a higher readiness of older children to meet in person with the people that they get to know on the Internet.

The majority of the pupils said that they aren't worried about leaving personal information on the Internet, but that they are decidedly against meeting a person from the Internet "in real life", which tells us that they do not connect these two indicators at all.

A significantly large number of pupils feel that they need institutional support from the state, which would be implemented by means of organized education of pupils. In the survey, the majority of pupils said that they would benefit the most from the help that schools would offer in the way of education. This attitude points to a need for mandatory institutional organized education of pupils about the risks and dangers of the Internet and social networks, and the necessity of their protection.

The obtained results showed that most pupils are not familiar with the legal and institutional framework for protecting on the Internet and social networks.

What surprised, however, is the dominance of pupils' responses that they parents do not "interfere" with the activities of their on the Internet and social networks, or that they do not undertake concrete activities to protect their child (55%).Only 11% of parents check how the pupils behave on the Internet, and no less than 48% of the pupils do not know if their parents are capable of helping them protect themselves from the risks and dangers of the Internet and social network. The part of research was also shown in Glusac, Ljubojev, Radosav, 2017 indicated that parents allocated their "conventional and usual social fears and concerns in a new, unknown cyberspace". [28] Simply put, the impression is that parents just

moved their familiar and traditional fears to the one, relatively new and, to them, insufficiently familiar context, as it was detected in the research carried out by UNICEF in 2016, about the level of awareness, potential Internet risks and misuse among the parents of children aged between 8 and 17. Parents expressed concern that their children are threatened on the Internet and that they need help in this field.[29]

The research confirmed the need for more interdisciplinary research in this field.

V. CONCLUSIONS

There are many risks for pupils on social networks, and it is evident that they are exposed to disturbing content. Many risks from the physical reality are transferred to the virtual surroundings, so the pupils can encounter various negative aspects of interpersonal communication with peers and adults on social networks. That is why special attention needs to be directed to children safety on social networks. Cyber bullying, characteristic for more and more frequent peer violence through ICT among children, as well as grooming and sexting are not recognized in any way as individual types of violence against children through ICT.

In order to measure the attitudes of pupils in the Zrenjanin a research has been conducted for the purpose of researching the perception of pupils regarding the risks and protection on the Internet and social networks, as well as the need for implementing measures for the protection of pupils on the Internet. A conclusion based on this research is that there is a certain perception among pupils of the risks and dangers they are exposed to on the Internet and social networks, but that most of the pupils are not familiar with the ways they can protect themselves and they need institutional help with that.

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On-line Social Networks Influencing Young People: A Case Study with Facebook in Banat Region of Serbia

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Abstract – The social network Facebook is used every day, and it has a big impact on people. The greatest use is among young people and this is shown in this paper. In addition, the time spent at the daily level is displayed, as well as the way of communication, whether more important is written or verbal communication, as well as the importance of real friends versus virtual friends. The population over which the research was carried out in most cases is young and on the territory of the Middle Banat.

I. INTRODUCTION

Facebook is online social media and social networking service. Its website was launched on February 4, 2004, by Mark Zuckerberg, along with fellow Harvard College students. The founders initially limited website's membership to Harvard students. Facebook gradually added support for students at various other universities, and eventually to high school students. Since 2006, anyone who claims to be at least 13 years old has been allowed to become a registered user of Facebook [9].

Social networks are relatively stable sets of relationships between social actors (whether it's about individuals, groups, organizations), which include exchanges of different resources (material services, information, values, understandings, norms, practices and similar.) and they have certain structure [4]. Facebook is an interactive social media that provides users with the creation of their own websites, themes, groups, photo galleries and online friends (who do not necessarily have to be friends in real life), with a high-level of all elements and care for self-determination of the level of privacy of everyone [6].

Most online communities can be divided into categories:

- Information – are made up of people who are looking for answers to everyday problems and make them "how-to" information and columns with tips written by professionals.

- Professional – they help progress in the profession, give advice on building a career, support scientific research and encourage discussion on industrial issues.

- Educational – are networks that students visit to collaborate with other students in academic projects, school researches or conferences with professor's throughs blogs and forums.

- Fun – collect people who share the same interests, hobbies and passions, making the most visited category [3].

II. RELATED WORK

Most of the people spend on Facebook go to communicate with others and games (which are most often dependent on communication and the exchange of items needed for game). This is an indication of the inexorable human need for communication, contact and socialization, even if it is only in virtual form. To create relationships with others, you need to provide several things: attractiveness, similarity, reciprocity and proximity. In the case of contact via web social connections, proximity is secured by modem and fast connection, which means less effort than ensuring physical proximity [6].

Users create groups that cover a whole spectrum of interests and thus create virtual communities that have an impact on the local and global levels. The added value of these system is that most of them offer the possibility of expanding business cooperation in terms of finding employment, offering services, recommendations, and the like [5].

According to Nielsen Online, it is noted that Facebook has become the fourth most common activity of Internet users. The time spent on Facebook is almost three times the time spent by the user on other websites [7].

One study has shown that Internet users, or rather those who make different acquaintances on the Internet, are perceived as having problems in social situations, when they are face-to-face, like shy, anxious, frustrated, lonely and depressed people, who are able to communicate only hiding behind the monitor [1].

By using Facebook, there are very serious problems and, consequently negative consequences. Facebook's disadvantages mostly affect the privacy of user data. In addition to the security risks that the user exhibits when entering his data on Facebook, there are other shortcomings. One of the disadvantages is the ability for the user to get to the virtual world that Facebook creates completely alienate from the real world [8].

Facebook is a popular form of online communication among adolescents and more and more adults. However, little is known about the true influence of "online" activities on individuals on their "offline" social life. By examining individuals about their "online" and "offline" activities, it has been found that there are matching friends who are not identical. The conclusion is that "online" activities are used to compensate for the dissatisfaction of the "offline" social life of an individual [2].

III.   METHODOLOGY

Research hypothesis is: "Using facebook by young people in Banat region of Serbia significantly influence their regular activities." The research is conducted by using online survey.

Based on the hypothesis and online survey, the results of a completed research of 85 people. The sample represents persons aged 19-30 years in 87.1% of cases. People responding to the survey are mostly young people and are shown in the following figure.
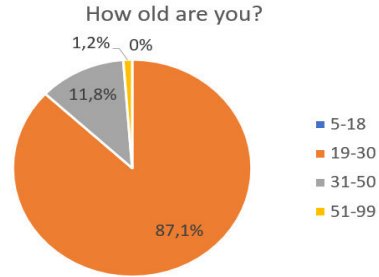
Figure 1. Age of respondents

The answers to this question showed us that most respondents are young, between 19-30 years old and that they are mostly young people who were born and grown up already in the digital age and that the sample is appropriate. The time scale on Facebook is as follows: less than 1h, 1-3h, 3-5h, 5h and more are considered too much.

IV.   RESULTS & DISCUSSION

Filled surveys with given answers to questions will show us the frequency of using Facebook. How often do you use Facebook to communicate with your friends and others? In addition, is the number of virtual friends important?
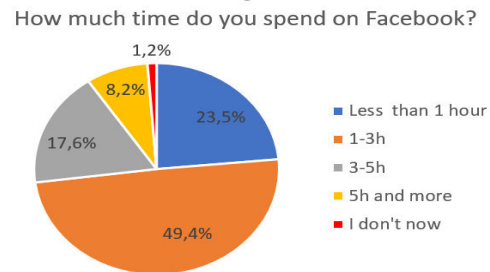
Figure 2. Frequency of using Facebook on daily basis

The responses showed that 49.4% of users replied daily to spend 1-3h on Facebook. While 23.5% of users spend less than 1h, and 17.6% of users spend 3-5h. 8.2% of users responded to Facebook for more than 5 hours daily, and 1.3% of users said that they did not know.
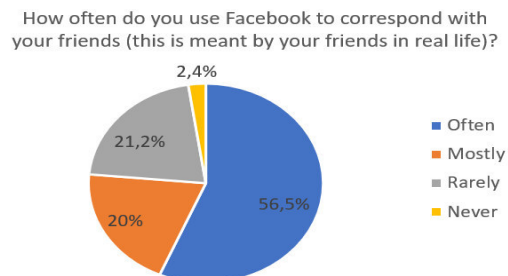
Figure 3. Frequency of using Facebook for correspondence with everyday friends

The answers showed that 56.5% of users often use Facebook to correspond with friends from everyday life, and 20% of users generally benefit, 21.2% of users use it rarely, while 2.3% never use it.

How often do you use Facebook for correspondence (under this one is meant by any of your friends)?
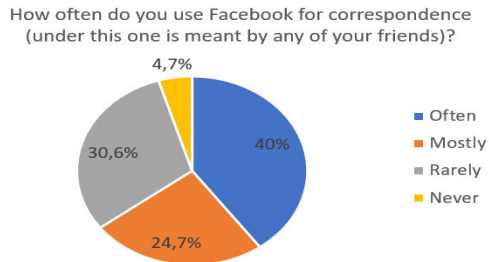
Figure 4. Frequency of using Facebook with any friend

The answers showed that 40% of users often use Facebook to correspond with any friend, and 24.7 of users mostly use, 30.6% of users use it rarely, while 4.7% never use it.

How often do you communicate in real life with friends with whom you are writing? (this refers to verbal communication, or discussion)
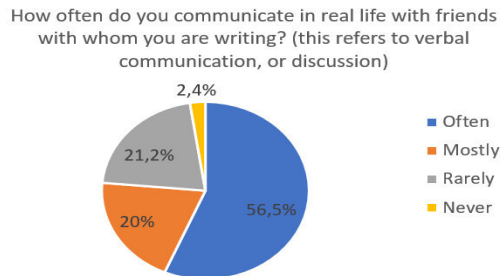
Figure 5. Frequency of verbal communication with friends we correspond to on Facebook

The answers showed that 71.8% of users often communicate with their friends, while 21.2% of users mostly, and 7.1% of users rarely.

Do you correspond more or talk to your friends?
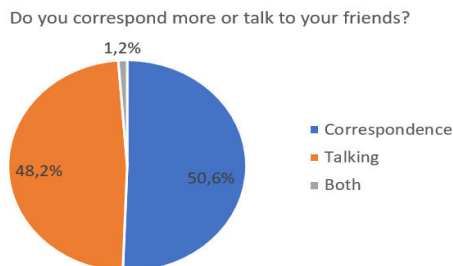
Figure 6. Representation of written and verbal communication with friends

The answers are equal, with 50.6% of the users getting more correspondence, and 48.2% talking to their friends. 1.2% of users answered that they use both forms of communication equally.

How often do you publish the statuses?
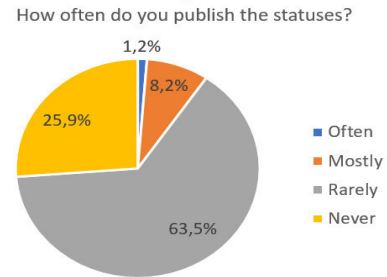
Figure 7. Frequency of publishing user status on Facebook

The answers showed that 63.5% of users rarely publish statuses on Facebook. While 25.9% of users never, and 8.2% mostly.

Do you care about the number of friends on Facebook?
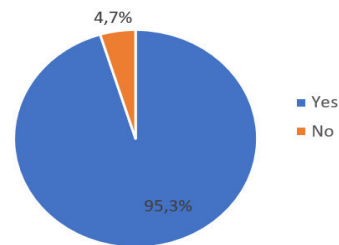
Figure 8. The importance of friends on Facebook

According to the answers, 95.3% of users answered that they did not have an important number on Facebook, and only 4.7% of users answered with a confirmatory answer.

Are real friends or virtual friends more important to you?
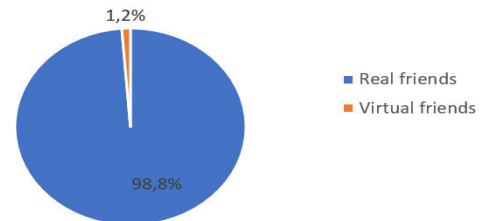
Figure 9. Importance of real friends vs. virtual friends

According to answers, 98.8% of users answered that they are more real friends, and only 1.2% are virtual friends.

Do you use Facebook in the presence of real friends?
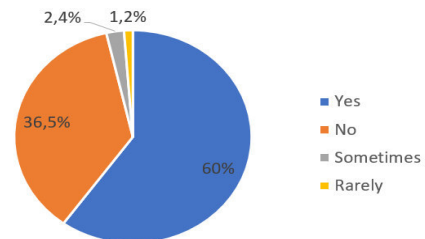
Figure 10. Frequency of using Facebook in the presence of a friend

According to answers, 60% of users responded to Facebook in the presence of their friends, and 36% did not use it. Sometimes it uses 2.4% of users, and rarely 1.2% of users.

How important is your popularity on Facebook?
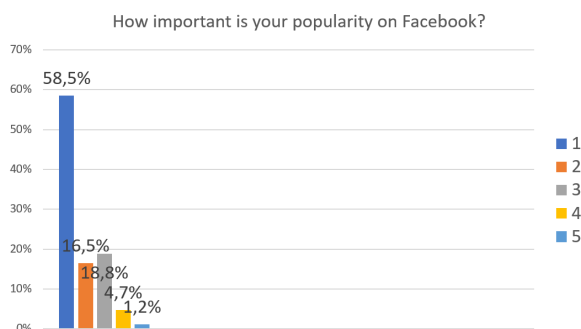
Figure 11. The importance of users' popularity on Facebook

According to answers, 58.8% of users answered that their popularity on Facebook was not important, while only 1.2% of users answered that they mattered.

V. CONCLUSION

This survey of 85 people who are mostly young showed that Facebook's social network daily uses 1-3h, and that written communication is equal to verbal communication.

In addition, it turned out that users are not more important virtual friends than everyday friends, and that their popularity on Facebook is not important.

The users of the largest number of Facebooks are young, between 19-30 years old. It was found that 58.5% of users often use Facebook to correspond with their everyday friends, while with virtual friends 40% of users.

Facebook users often talk to friends with whom they write each day. Therefore, written communication is equal to verbal communication. Users rarely publish statuses on Facebook, which means Facebook is more used for correspondence.

95.3% of users gave the answer that their virtual friends are not important. It's been shown that Facebook users are still more important friends than everyday lives than virtual friends, but 60% of users still responded to Facebook in the presence of their friends.

In the end, 58.8% of respondents answered that their popularity on Facebook was not important, and only 1.2% of users said it was important.

The set hypothesis was not confirmed, as it was concluded that Facebook uses only 1-3h daily. Written and verbal communication is used equally, and the number of virtual friends is not more important than real friends.

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Analysis and Recording Vehicle Sound Using a Smartphone

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Abstract: There are many reasons for classifying vehicles for petrol and diesel fuel. Human ear can often successfully distinguish the sound of petrol and diesel engines. This distinction research in the field of traffic can be of great benefit from the aspect of vehicle categorization, ecology, and so on. The aim of the research is to compare the digitized sound recorded with a smartphone of the specified groups of vehicles and to explore the possibility of their automatic classification based on the frequency components in the spectrum having the largest amplitude. The technique is relevant for students of environmental protection and ecology.

I. INTRODUCTION

The development of information technology, i.e. software tools, has contributed to easier and more efficient processing of multimedia data: text, images, sound, video, and in the work emphasis is placed on sound analysis.

Sound represents a spatial mapping of the signal that transmits sound symbols or data. This mapping can also be called sound waves caused by oscillations of sound sources and transmitted through the environment to the human ear. Like most of the signals in nature, sound is of a continual character in a time domain, it has an infinite number of possible values within a limited set and is defined at any time. In order for such a signal to be processed, stored and played on a computer, it is necessary to perform its digitization. Digitization is a process that allows the continuously variable from the nature (eg sound) to be presented in digital form on a computer, and it implies: sampling (time discretization), quantization (amplitude discretization) and encoding [1].

Audio recording has been used for various purposes since the first recorders, then the computer with sound cards until today, when audio recordings can be made with mobile electronic devices such as smartphones [2]. They became "omnipresent computers" that, besides communication, have a large number of functions and applications [3]. An integrated audio recorder is understood in smartphones.

II. PREVIOUS RESEARCH

The vehicle has multiple sources of sound depending on the mode in which it operates: the sound produced by tire friction and the road, sound due to air resistance, the sound of the transmission system, the sound of the combustion process. Exactly the sound caused by the process of combustion of fuel makes a large percentage of the overall sound produced by the vehicle [4]. This is particularly pronounced for DI (Direct Injection) vehicles, where high - frequency components appear in sound. The effect is expressed and known as the „knocking" of diesel engines, and it is represented mainly in the frequency range from 500 Hz to 6 kHz. Therefore, when it comes to sound quality, both in the interior and outside, diesel vehicles can hardly be compared with gasoline [5].

Detection and classification of vehicles by weight, size, number of axles, based on sound, can be made using the coefficients MFCC (*Mel Frequency Cepstral Coefficients*). Extraction of coefficients from the sound of the vehicle, allows formation of training vectors for the most commonly k-NN classifier (*k - Nearest Neighbour*) [6,7]. In practice, for the detection and classification of vehicles in intelligent transport systems, most commonly used are video detection, inductive loops, magnetometers, piezoelectric cables etc. [6].

III. METHODS

The aim of the research is to compare the digitized sound of vehicles on petrol and diesel fuel and explore the possibilities for their classification based on the frequency components in the spectrum that have the largest amplitude. Therefore, it is necessary to determine whether there are significant differences in the sound frequencies emitted by the two specified groups of

vehicles in order to identify the vehicle automatically.

The first step in the research is data collection, i.e. recording sound and recording locations. It is important to note that MATLAB and Minitab14 software tools were used for the realization of the research. MATLAB, as a simulation and engineering environment, is used to analyze the amplitude spectrum of each of the sounds and extract the frequency components of the signals that carry the largest amplitudes (dominant frequencies). Minitab is a statistical tool that has been used in the work for the comparison of the dominant sound frequencies of petrol and diesel vehicles.

Audio recording or digitalization of the analog sound of the vehicle was performed using a LG E610 smartphone, with a sound recording option. By random recording, a database of 28 audio files was obtained, 14 of which are for petrol vehicles and the same for diesel vehicles. The average audio duration is 1.41 s. Before processing the sound, the files are stored on a computer in *wave* format with a sampling frequency of 48 kHz (number of samples in one second) and a quantization of 16 bits for representing the amplitude value of a single sample.

Recording locations have been selected so that vehicles are practically stationary or moving at a very low speed (<10 km/h) to avoid the influence of other sources of sound at higher speeds (tire bruising, air flow...). In this way, the recorded sound is largely derived from the engine and the exhaust system. In Figure 1, two locations for recording in the city of Doboj are marked: Location 1 and Location 2.
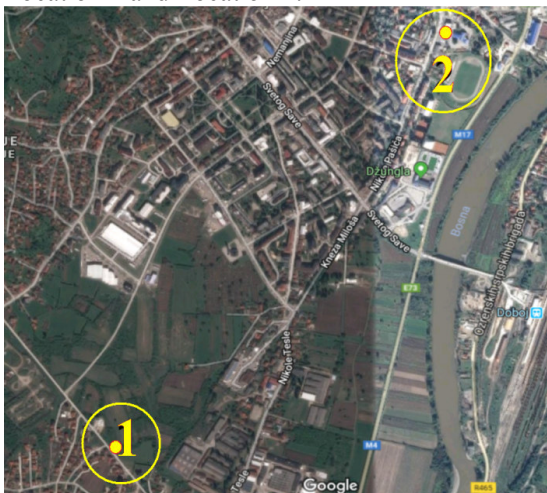
Figure 1. Locations 1 and 2 in Doboj on which sound recording was performed.

Location 1 (SFOR route) was chosen because the traffic intensity is low and that on the roadway, about 2 meters from the recording location, there are physical obstacles (lying policemen), so that the speed of the vehicle is very low when recording. Location 2 is the „Nešković" petrol station in the of Nikola Pasic Street. It has been selected due to the large number of different stopping vehicles, and in addition, it is possible to record sound when idling or at very low speed.

IV.   RESULTS AND DISCUSSION

Time domain to frequency domain transition, enabled us a completely new look at the nature of the signal and facilitated the process of its processing because it is reduced to the processing of some simpler components [8]. It is necessary to know the amplitude spectrum of each of the recorded sound signals in order to identify the dominant frequencies. The Fourier transform produces an infinite set of components, and since the computer only works with the final set, it was necessary to calculate the Fourier transform in the final number of points N. This enables the Discrete Fourier Transformation (DFT):

$$F[n] = \sum_{k=0}^{N-1} f[k]e^{-j\frac{2\pi}{N}nk} \ (n = 0:N-1) \quad (1)$$

where $f[k]$ is a set of discrete signal values. Inverse Discrete Fourier transformation takes the form:

$$f[k] = \frac{1}{N}\sum_{k=0}^{N-1} F[n]e^{j\frac{2\pi}{N}nk} \quad (2)$$

To calculate the Discrete Fourier transform, we used an algorithm called FFT (Fast Fourier Transform) [9]. Therefore, the amplitude sound spectrum was obtained by calling the function "fft" over the vector which represents the amplitude values of the signal in the time domain in the N points. N represents the product of the sampling frequency (Fs) and the duration of the audio recordings. For the spectrum to be symmetric around the zero frequency and to display the frequency range from -Fs/2 to Fs/2, as in Figure 2, the "fftshift" function was used. Frequency components with the largest amplitude are identified at the points of local maxima in the spectrum using the "findpeaks" function. For the purpose of mutual comparison, from each spectrum we identified 30 dominant frequencies and we calculated their arithmetic mean (for each spectrum).

After allocating the frequency components with the largest amplitudes in the spectrum and calculating their arithmetic means, it was necessary to perform a statistical comparison.
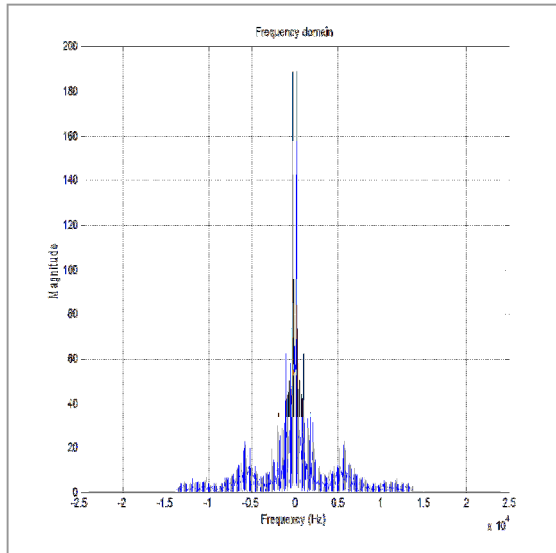
Figure 2. Amplitude sound spectrum for the Peugeot 207 (Petrol).

The arithmetic means of dominant frequencies in Hertz (Hz) for 14 diesel and 14 petrol vehicles are given in Table 1. If the data is displayed using boxplot, it looks as in Figure 3, where two extreme values can clearly be seen in the group of Diesel vehicles. Their average frequency among the dominant amounts is 1084.48 Hz and 1021.91 Hz, and these are the VW Golf 2.

TABLE I. ARITHMETIC MEANS OF DOMINANT FREQUENCIES FOR DIESEL AND PETROL VEHICLES

Serial number	Diesel vehicles	Petrol vehicles
1.	407,38	249,84
2.	216,73	203,65
3.	1084,84	143,36
4.	146,48	542,56
5.	349,74	170,88
6.	522,73	320,05
7.	200,58	348,9
8.	296,35	142,91
9.	278,42	434,87
10.	288,35	272,74
11.	1021,91	348,22
12.	220,08	113,03
13.	395,42	88,85
14.	201,44	141,06
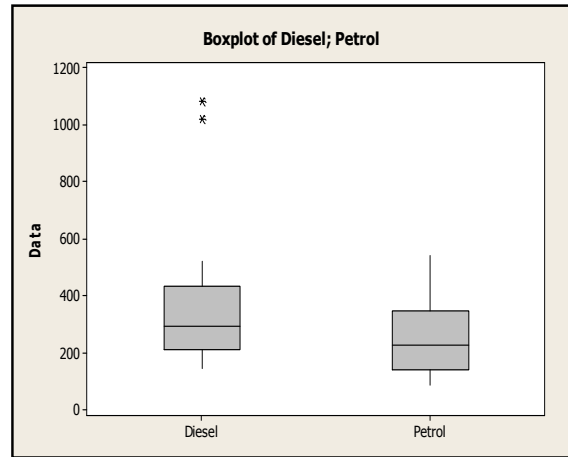
Figure 3. Frequencies displayed by boxplot for two groups of vehicles.

In order to determine the existence of a possible difference between the dominant frequencies of vehicles for petrol and diesel, it was necessary to test the equivalence of the arithmetic means of two independent samples.

The result of testing the normality distribution of the observed frequencies using Kolmogorov-Smirnov test, and the appearance of the distribution itself is shown in Figure 4 and Figure 5. The resulting p value ($p < 0.01$) is less than the significance level $\alpha = 0.05$, so the assumption on the normality must be rejected, which means that the frequencies do not have a normal distribution. The statistical procedure we used to test the assumption of the equality of two independent samples, in the case of a distribution deviating from the normal, is a non-parametric alternative to the t-test of independent samples and is called the Mann-Whitney U test [10].
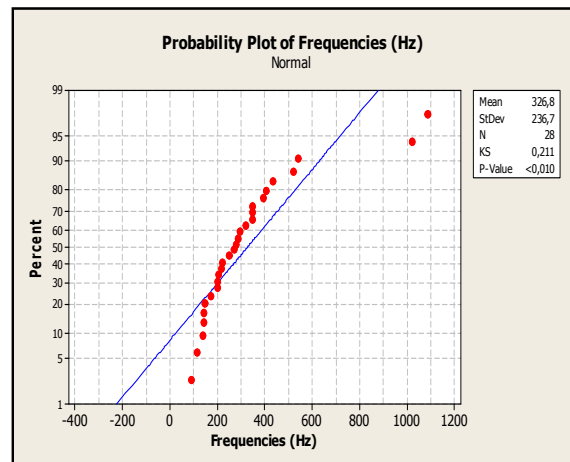
Figure 4. Distribution of arithmetic means of frequencies.

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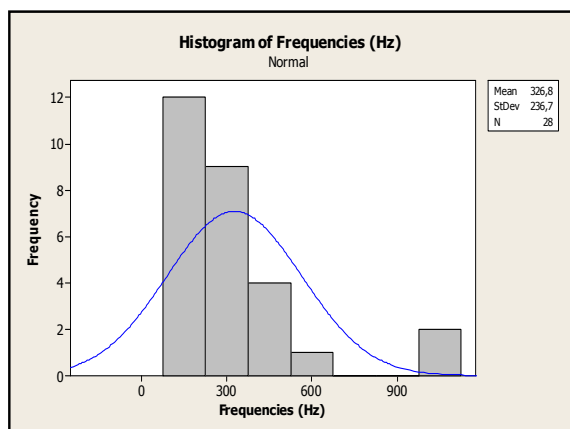
Figure 5. Histogram of arithmetic mean of frequencies.

The software gives the following result for the test:

```
Test of ETA1 = ETA2 vs ETA1 not =
ETA2 is significant at 0,0935
```

Assuming that the significance level of the test is α=0.05, the obtained p value of the statistics (0.0935>0.05) indicates that the initial assumption of the equality of two independent samples cannot be refused.

V.   CONCLUSION

Based on the results of the research we could conclude that there are no significant deviations in the frequencies of the sounds emitted by vehicles on petrol and diesel fuel. Frequency components with the largest amplitudes for selected samples are concentrated to 1100 Hz. However, it can be noticed that diesel vehicles emit sound at a slightly higher frequency due to the mentioned knocking effect of the diesel engine. In particular, this is highlighted in two extreme values that fit older cars in the VW Golf 2. They have perceptively noticeable characteristic of the diesel engine. Further research could be focused on the comparison of the sound of diesel vehicles of the newer and older generation.

In the case of a classification based on certain sound frequencies, as indicated in the research, it can be expected that the results will not be accurate due to the lack of a clear boundary between the frequency components of petrol and diesel vehicles. However, it should be kept in mind that no professional equipment such as digital audio recorders was used during sound recording, so this technique can be used as a demo tool for students of environmental protection and ecology.

Further research in this area can find its application that would be beneficial in terms of ecology, transport research, energy, and so on. Main focus of future investigation will be directed toward application in education.

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Computer Networks and Communications

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Abstract - The computer network has the task of exchanging data, as well as other data with computers that are interconnected in a given network. Data exchange is very important because it is used in a wide geographic area. In order to carry out data exchange in a wide area, different types of networks are being used. All of them have a role to speed up the connectivity of interested parties and allow data exchange, thus improving communication between users.

I. INTRODUCTION

The network serves us to exchange data and other information resources with the computers we're connected to that network. The WAN network is a telecommunication network extending over a larger geographic area, whether it is a city, a region or a nation. Business as well as state entities use WAN networks to exchange data between their employees, customers, clients and suppliers from different geographic areas. This type of telecommunication technology enables effective business operations on a daily basis regardless of the distance between the clients. This is exactly where WAN is used in contrast to PAN (personal area netwok), LAN (local area network), CAN (campus area network), MAN (metropolitan area network), which are often limited to room, building, university or a specific part of the city in which they are located.[1]

According to the spatial distance of the computer network we can divide it into:

- LAN – Local Area Network
- MAN – Metropolitan Area Network
- WAN – Wide Area Network

II. WAN NETWORK

WAN is a computer network that extends to a larger region, more states, or to the world. In terms of using the WAN network, it is best to describe it as a computer network that uses certain protocols and concepts for long distance transmission, as well as between LANs and MANs and other localized computer networks. The WAN network of computers is widespread at a distance of 50km, the most famous kind of such connection is today's Internet. The Internet is WAN, which is the best and easiest definition of a WAN network. the internet is built on a large number of LAN and MAN networks that are spread over a wide geographic area, so the connectivity of these networks makes the internet today.[2]

The Internet is the world's networking computer network which has changed how communication systems work. The beginning of the Internet is linked to the creation of ARPANET in 1969, the networks are under the control of the US Defense Ministry. The Internet is a combination of media, computers, and telecommunications. The term Internet is related to a network within the network, i.e. communication between multiple computers. The Internet has emerged as a need for simple and reliable information sharing between computers. In order to use the Internet, it is necessary to use the public communication structure.

A. What is WWW (World Wide Web)

The WWW has become a synonym for the Internet as it is the most famous service and the fastest growing part of the Internet. Huge interest in the Internet is exactly the consequence of using the WWW. WWW is actually a system for sharing information of different types. Websites combine text, sound, graphics, animation and other multimedia elements. Each web page may be linked to other sites by hypertext linkage. Websites are built using various HTML, CSS, PHP, MySql web tools.

B. HTTP (Hyper Text Transfer Protocol)

HTTP is a set of application protocols used on the Internet. The protocol itself is based on the WWW, and used for communication between the web browser (browser) and the web server (server).

C. Connecting a WAN Network

The WAN network is used to connect multiple LANs together so that users and computers at one location can communicate with other users and computers at another location. There are many WANs that are strictly designed specifically for one organization which are private. To connect

computers that are separated on larger geographic distances, we need the help of public communications infrastructure and its services, i.e. public telephone network It is also necessary to initiate different communication protocols in the network.

Some of these connections are:

- Dial-up connection.
- ISDN connection.
- DSL.
- Satellite.
- GPRS.

III. CISCO INTERNETWORK DESIGN

Cisco Systems, Inc. is an American multinational company dealing with the design and sales of consumer electronics, computer network equipment, communication equipment and services. At the same time, Cisco is one of the largest technology companies.

The company has a reputation as one of the best in network equipment and WAN networks. Various certificates are issued under the license of this company. Cisco Certified Network Associate (CCNA) Program (Routing and Switching) is the first step towards understanding the process of computer networks and working with Cisco networking equipment. Attendees are also being trained to work on small and medium-sized computer networks. In addition to the acquired practical and theoretical knowledge, attendees, upon completion of the CCNA Academy, are being prepared for the Cisco Certified Network Associate certification, and this certificate is an internationally recognized certificate of skills of working with computer networks and Cisco network equipment. Whoever completes this course can easily do a complex job of setting up and maintaining network equipment as well as monitoring WANs.[3]

IV. WAN DESIGN

Organizations that are trying to connect more offices or remote staff must take into account various things that will affect network efficiency and maintenance costs. When designing and installing, i.e. setting up a WAN that will use data transfer, i.e. sound, video, and other data, they must be included in the WAN network design. Particular attention must be paid to how much data will flow through that network, which protocol the network will use, network security as well as the inclusion of new technologies and applications in the near future. When designing such networks, the issues you have to address are the short-term,

mid-term and long-term goals of that organization. Among the factors that need to be considered we have:

- Staff
- Existing apps
- Planned applications
- Local Access Requirement
- Remote Access Requirement
- End User Equipment (Workstations)
- Network equipment (routers, switch)
- Connecting outside the organization
- Competition

Designing a WAN requires a lot of expertise, practical knowledge and problem solving skills. There are various topologies and technological options for designing a WAN network such as: ISDN, frame relay, X.25, ATM and VPN.

V. CIRCUIT SWITCING

Circuit switching is the methodology of implementing a telecommunication network where two network nodes establish a temporary network channel before nodes can communicate with each other. The established link between nodes guarantees full channel transfer rate and remains attached as long as the session lasts. An example of such a connection is just an analogue connection between two phones. When a call is made between two telephone devices, a direct connection between these two devices is established as long as the call is in progress. Circuit Switching technology is in contrast to Packet Switching where data is shared and sent independent of each other. The line is occupied for so long and therefore unusable until the line is released and no new connection is made.

Example of circuit-switched network:

- Public telephone network - Public switched telephone network (PSTN)
- ISDN B - channel
- Circuit Switched Data (CSD) and HSCDS (High-Speed Circuit-Switched Data) used in mobile GSM technologies
- X.21
- Optical Networks

VI. ISDN (INTERGRATED SERVICES DIGITAL NETWORK)

ISDN was created in the late 1970s. ISDN is the most profitable WAN technology that represents the integrated services of the digital network. ISDN can simultaneously support data, audio and video transmission. ISDN uses leased lines and uses telecommunication infrastructure to connect a remote network.[4]

Two types of access to ISDN:

- BRI (Basic Rate Interface) - consisting of two telephone lines, the so-called. B channels of 64kb / s, and one D channel of 16kb / s.
- PRI (Primary Rate Interface) - this type of access has multiple B channels and their maximum depends on the telephone network in individual countries of the world: North America, Japan 23B + D (total 1.544 Mbit / s (T1)) Europe, Australia: 30B + D (total 2.048 Mbit / s (E1))

VII. PACKET SWITCHING

Packet switching is a type of digital technology that combines all types of packets sent regardless of the content, type, or structure and aggregates them to a certain size of the data block called the packet. When data goes through network adapters, sliders, routers, and other network nodes, the packets are located in the buffer, resulting in certain delivery delays depending on the network congestion.

X.25 is WAN technology and is most widely used in Packet Switching Networks, such as telecommunications companies. It defines the physical layer, data link, and network layers of the OSI model. Such networks were popular in the 80s and 90s, and are still in use with transaction systems. X.25 devices include data terminal equipment, data circuit-terminating equipment, and packet switching equipment. This type of network is largely used in many undeveloped countries.

VIII. CELL RELAY

The cell relay method refers to the statistical multiplexing of small fixed-length packets called cells. The transfer rate in this method is about 56kb / s and up to several gigabits per second. The most known kind using this transfer method is ATM, and it is used for home-based DSL connectivity. The disadvantage of this type of connection is that there is no control over the transmission or the possibility of correcting the mistakenly transmitted data.

IX. CELL RELAYATM (ASYNCHRONOUS TRANSFER MODE)

ATM is an asynchronous transfer which is a cell relay packet switched network. In the ATM network, the connection is realized between two points via logical connection. A large number of telecommunications companies have included ATMs in their WANs. The main feature of this technique is that, besides data transfer, it also enables the transmission of other types of traffic such as digitized voice (phone) and image (video). This is one of the reasons for using ATMs with ADSL services.

X. VPN

VPN (Virtual Private Network) represents a virtual private network as a secure access to remote locations through public telecommunication networks such as Internet or Intranet. VPN provides a secure connection between two remote locations via protocols such as L2TP and PPTP. Communication between entities of this structure is protected by encryption whose parameters are agreed by both parties. The choice of encryption algorithm and key length is of great importance for the security of established communication, and only in the case of third application, where communication between networks is not public, encryption plays a somewhat minor role.[5]

IP packets exchanged between computers at the ends of a VPN channel are encrypted and unreadable to other Internet users. Within local networks that are linked in this way, the packets are decrypted and readable by computers that have access to that VPN network. This results in the same effect as in the case of two networks connected to a special local or leased link, with all the advantages of such a connection. This connection, due to its features, is called VPN IP tunnel, and the process of connecting is called IP tunneling.

XI. CONCLUSION

The network as a system has enabled us to connect two or more computers to one large user group that can exchange data of all kinds and usage, i.e. different peripherals sharing. The largest WAN network used by the whole world is today's Internet. The Internet is a publicly available global packet data network that connects computers and computing networks using the same protocol (Internet Protocol). It is a "network of all networks" that consists of millions of home, academic, business and government networks that exchange information and services such as email, data transmission, information, and the use of Internet sites.

Designing a WAN network requires a lot of knowledge and it is a great importance to plan how, to what extent and what will be required in the future for a good, fast and, above all, safe use of the network for good business and data exchange. Today's service providers have highly

complex networking systems based on optical connectivity. Constant connectivity point-to-point uses dial-up leased lines, which are slow, but can still be used well in a domain limited to the use of different technologies. Public infrastructure uses DSL, cable, wireless, 3G / 4G in mobile technologies. With this type of connection, secure transfer is only possible via remote access, i.e. by using a VPN.

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Comparative Analysis of IT Subjects' Teaching Quality in Highschools

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ABSTRACT

Paper presents the research which authors conducted in the school year 2016/17. The research sample included 1504 pupils from 10 different educational profiles: 4 in high schools (natural mathematics, informatics, mathematics, computer science) and 6 in secondary vocational schools from which 4 were electrical professions (computer technician, multimedia engineer, computer network administrator and electrical engineer of information technology) and 2 mechanical professions (machine technician for computer engineering and computer control technician). Results have shown that there was significant difference between profiles in teaching quality of IT subjects. Future work is related to analysis of current IT knowledge in high schools.

According to the decision of the Scientific Committee of the ITRO Conference, the entire paper is scheduled for publication in the Journal ITRO Vol.7.

Model of Early Warning and Response to the Threats of Population Due to Communicable Diseases

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Abstract - This paper presents a draft model of early warning systems and responses to threats to the health of the population caused by contagious diseases that would be upgraded to a public electronic service (JES) for reporting infectious diseases of Institute of Public Health of Vojvodina. The goal of developing the module is to introduce a modern system of early detection and warning of threats to the health of the population of AP Vojvodina.

I. INTRODUCTION

Within the Special Programs in the field of public health in the AP Vojvodina, a public electronic service (JES) was introduced for reporting infectious diseases. Institute of Public Health of Vojvodina and each of the public health institutes on the territory of AP Vojvodina automatically collect data from the territory for which they are responsible. All electronic data that the Institutes receive is stored on servers and physically secured from unauthorized access, and service applications which are using this data are protected by usernames and passwords. To date, all health centers in the territory of AP Vojvodina are included.

The epidemiological situation is a dynamic category and its assessment in order to propose appropriate measures requires timely and accurate information that can be provided by electronic surveillance systems. In terms of an increasing number of infectious diseases, the epidemiological situation in Vojvodina can rapidly change due to the emergence of new and re-emergence of previously known infectious diseases, which is due to changes in surrounding countries (epidemics of smallpox, BIH and Romania) and global climate change (fever of the western Nile recognized as a new autochthonous disease, the first diagnosed imported case of dengue fever), as well as changes in our country (the largest number of newly discovered HIV infections in 2015 since the introduction of surveillance). Nosocomial infections and antimicrobial resistance are problems of enormous magnitude that affect the

morbidity and mortality of hospitalized patients as well as their cost of care. The Data Mining Surveillance System (DMSS) uses new data mining techniques to discover unsuspected, useful patterns of nosocomial infections and antimicrobial resistance from the analysis of hospital laboratory data (Brossette at all, 2000).

This paper presents the draft of a model of a modern early warning system and a response to threats to the health of the population of the AP Vojvodina, with the harmonization of the criteria with the recommendations of the European Commission, which aims to point out the potential changes in the epidemiological situation towards the state of emergency caused by certain infectious diseases.

II. APPLICATION OF DATA MINING IN THE EARLY DETECTION OF INFECTIOUS DISEASES

The healthcare environment is still „information rich" but „knowledge poor". There is a wealth of data available within the healthcare systems, and medical data mining has great potential for exploring the hidden patterns in the data sets of the medical domain. (Soni at all, 2011). The revolutionary development of technology has resulted in the rapid introduction of cutting-edge technologies into our societies (Hadzic, Dillon, 2009).

Data mining (DM) is the most important product of the Business Intelligence product family, the purpose of which is to find hidden data patterns, increase their usability and transform it into useful knowledge. It is a technique of data search in order to identify the requested samples and their mutual relations. Data minig is often called database knowledge discovery (KDD). It is defined as a process of discovering useful templates or knowledge from data sources, most often databases, images, tutorials, etc. The templates must be understandable, valid as well as

potentially useful. Data mining is a multidisciplinary field that includes machine learning, databases, syntax, artificial intelligence, data recovery, and data visualization. There are many data mining operations. Traditional data mining uses structured data stored in relational tables, lists or files in tabular formats.

This model will use the SOAP protocol with authentication to access the service. The database is located on the MySQL server. Data is processed on a server, a "Unix" based system. All tools and services used to create an electronic service are "opensource". The basic protection is in 128-bit data encryption between servers and clients. Address of the computer is filtered, which discards all clients that are not in the list of defined public addresses. Only people authorized by the responsible data manager have access to databases, with user codes. All access codes to databases are stored in a computer server, in "log" files, and at any time it can be seen who accessed the data. By introducing JES in AP Vojvodina, daily, continuous insight and monitoring of infectious diseases on the wider territory of the Province is enabled. In the course of 2015, JES reported 7% more reports of infectious diseases than regular individual applications submitted to the Institute for Public Health of Vojvodina. The research will be based on the development and testing of new software solutions by comparing them with the use of existing data mining techniques. The quality and quantity of data provided by new and old solutions will be measured. New solutions are needed to harmonize the reporting criteria with EU recommendations, first of all by introducing a case definition.

III. LEGAL FRAMEWORK

The legal framework that allows the construction of this module is:

- Law on Health Care ("Official Gazette of the Republic of Serbia", No. 107/05 and 72/09), Article 13

- Law on Medical Records and Records in the Field of Health ("Official Gazette of RS", No. 123/2014)

- Law on the protection of the population against infectious diseases ("Official Gazette of RS"), No. 15/2016

- Law on Public Health ("Official Gazette of RS", No. 15/2016), Article 14

- Law on Determining the Autonomy of the Autonomous Province of Vojvodina

("Official Gazette of the Republic of Serbia", No. 99/2009) Article 47

- Law on Emergency Situations ("Official Gazette of RS", No. 111/2009, 92/111 and 93/2012).

Data management, collection and processing are performed in accordance with the law governing the protection of personal data.

IV. PRESENTATION AND ANALYSIS OF THE EXISTING SITUATION IN THE SURVEILLANCE OF INFECTIOUS DISEASES

Medical diagnosis is regarded as an important yet complicated task that needs to be executed accurately and efficiently (Sony at all, 2011).

The largest number of infectious diseases in the area of AP Vojvodina is reported on the basis of clinical diagnosis, without etiological confirmation (laboratory microbiological diagnostics). Due to the non-compliance of reporting criteria, the same clinical entities are reported under various diagnoses. Ethically unexplained cases of the disease cannot be linked epidemiologically, and most of the infectious diseases are registered as individual diseases. Grouping illnesses and low intensity epidemics are not detected. Laboratory testing for etiological confirmation of the diagnosis is either not used enough or is not in the function of surveillance (if patients do not take the result or do not report to the doctor with the result). A number of doctors do not participate or insufficiently participate in the surveillance system leading to sub registration of the disease. Reporting insufficiency negatively affects the quality of control of infectious diseases, which is crucial for the adoption of strategic programs and monitoring the effects of prevention and control measures for contagious diseases.

Starting from the implementation of the software solution in the Health Care institutions and collecting data related to the recording and collection of infectious diseases, since 2013, applications have started to arrive continuously, every day, always in the same time period for the previous day. During 2013 and 2014, the electronic service was implemented in 36 health centers on the territory of the Province, which included 85% of the population of AP Vojvodina. During 2017, over 99% of the population of Vojvodina was covered by electronic services, and the final activities are ongoing in the territory of the municipality of Kanjiža.

Comparative analysis showed a significant difference: namely, the registered number of

infectious diseases is registered by electronic service and is higher than the number of applications that came to the Institute for Public Health of Vojvodina by official means. During 2016, there was a change in the legislation and a reduction in the number of infectious diseases that are subject to reporting. The electronic service enables further monitoring of syndromic diagnoses and the movement of diseases that are assumed to be contagious etiologies and consequently the creation of early warning systems and response to certain changes in the epidemiological situation on the wider territory of Vojvodina.

V.   MODEL OF EARLY WARNING SYSTEM AND RESPONSE TO THREATS TO THE HEALTH OF THE POPULATION OF VOJVODINA

Using DM techniques, new modules will be created within the JES application for infectious diseases that will be able to support all the processes of automatic recording and reporting of infectious diseases in the territory of the Province, but also to provide other information important for the record and epidemiological examination, which will enable:

- better support in deciding on the most important public health problems and increasing the efficiency of the measures taken,

- better and faster proposing measures to suppress epidemics,

- planning of intervention measures and activities in the context of social health care at the Province level, especially in emergencies where contagious diseases are expected.

The goal of developing the module is to introduce a modern system of early detection and warning of threats to the health of the population of AP Vojvodina. The module should enable the establishment of grouping of infectious disease cases by defining a software solution that will enable the display of "signaling events" by topographic representation on the territory of AP Vojvodina by linking the common characteristics of cases (chronological, demographic and case definitions) where the DM uses the most sophisticated decision support system as a statistical and mathematical model for data analysis. The achievement of these goals will be facilitated by improving the speed of data flows on the occurrence of certain infectious diseases, as well as data on performed microbiological services within the health system in the territory of AP Vojvodina.

A.   Logical structure of the model

The model is based on identifying key words from three sets of criteria: clinical, epidemiological and laboratory. The model is applied at the workstations of each selected physician throughout the territory of Vojvodina in all health centers, with all selected physicians. The first criterion to be fulfilled is clinical and is based on a doctor's and patient's interview about the problems that he is seeking for help or anamnestic data on the clinical picture. The doctor determines the presence of certain loops and symptoms of the disease in the patient, and then through the predetermined answers provided, it determines up to 7 symptoms and signs that confirm in the given menus. Based on the case definitions established by the European Commission with its 2012 document and confirmed symptoms and signs of a patient's disease during a review by a doctor from the offered menu, the model compares the compatibility of one and the other and offers the doctor a suspicion on the presence of certain infectious diseases in which the clinical criterion in the case definition is fulfilled.

Figure 1. Advanced Epidemiological Surveillance

Parallel to this in the second part of the screen, the model offers a list of epidemiological criteria from the EC case definition that may be present in a particular disease. This creates the second set, and the necessary criterion for confirming the "signal" for early warning and response. By choosing the appropriate epidemiological criteria from the given menu, the doctor definitely raises suspicion of a particular infectious disease according to the definition of the case, and the said "signal" is created. The module according to the logical model then offers the doctor a narrowed list of diseases and the third part opens on the screen indicating the appropriate laboratory, microbiological analysis to be directed to the patient in order to confirm the disease according to the definitive case. Then, an electronic instruction issued to the patient can be created. At the moment of selecting a laboratory analysis, a style / record is

created, which is depersonalized (it contains information on the type of suspicion of a certain infectious disease and possibly age and gender of the patient) and is stored in a temporary database at that workstation.

At the end of the working hours, the system combines all temporary databases from all workstations into the Health Care Center database, which is automatically sent through the JES to the competent public health institute during the night and to the Public Health Institute where the databases are located on the server. A room for situational regeneration and monitoring can be prepared at the competent institute or public health institute, whereby with specific software in almost real time they monitor the detected signals and are displayed on the map of Vojvodina as flashing points, painted in a certain color. There may be more monitors depending on the needs and assessments of the competent epidemiological service. In case of suspicion of serious or dangerous contagious disease, the competent health authorities as well as the provincial emergency headquarters will be notified

B. Class diagram

The class diagram is modeling the static structure of the system. It illustrates data model of information system, gives us better understanding of an application structure. It shows relationships between classes, objects, attributes, and operations. Classes represent an abstract entity with common characteristics. Associations represent the relationship between classes.
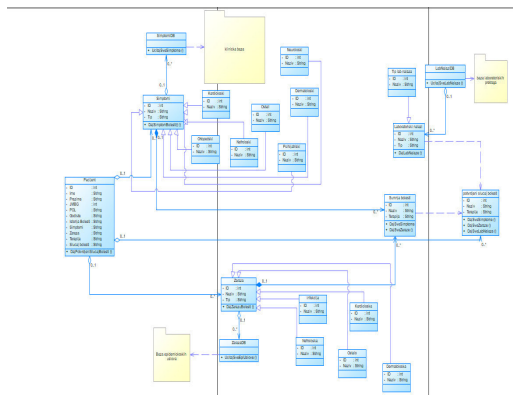
Figure 2. Class diagram

Component diagram

Today, the development of web applications is very important, especially because of the possibility of running on mobile devices. Of course, the development of separate mobile applications is on the increase. The next component

diagram shows relation between set of components of a modern web application.
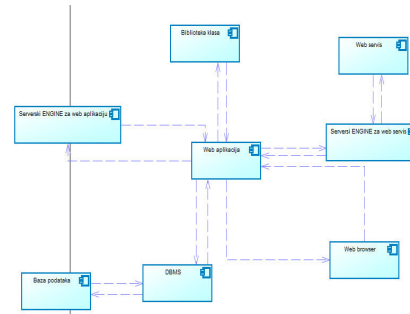
Figure 3. Component diagram

The client's Web browser browser addresses a web application running on a special "web server" program that allows interpreting and executing commands in the web application ("Server's ENGINE"). In order to facilitate ease of maintenance, web applications are developed as multilayered, where some parts of the code are placed within special class libraries. Class libraries are compiled and executed in a web application in order to support individual parts of the functionality. The same class libraries are found most often on the same computer as the web application itself or on special computers called the Application servers. One part of the functions can be used by other software vendors by connecting with remote web services (it does not always have to be a "whole" application in one place, but some other functionality is done by another software company and offered for public use as a service which is free or paid within a specified contract period). Web services are on-line library classes accessed via URLs. Of course, business web applications are mostly based on databases and in order to use them, database management systems are included as special components.

C. Deployment Diagram

Deployment diagram show as witch software elements are deployed by witch hardware elements and provide us a view of the hardware system topology. In this example, the Thin Client is used, which is a variant of the client-server architecture when only a smaller application part on the client computer is located, and the entire program logic and databases are located on other computers-servers. A typical situation is when a client computer has only a web browser that accesses the web server where the web application is running.
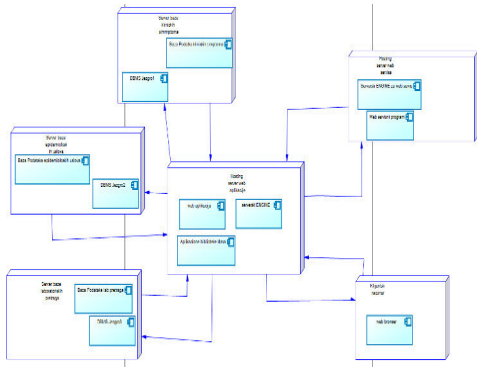
Figure 4. Deployment diagram

D. Use-Case Diagram

Use case diagrams are diagrams of usage cases, illustrating a set of usage cases and actors. It is used to display the functionality and behavior of an entity. It serves to explain to the user more about what the system is doing and to check its functionality. They consist of participants, use cases and their interconnections. The diagram is used to model the system or application subsystem.
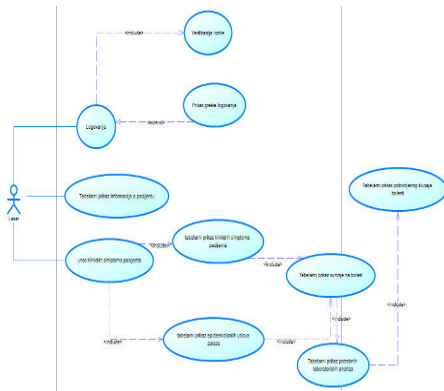
Figure 5. Use-case diagram

VI. PERSPECTIVE OF THE APPLICATION OF THE PROPOSED MODEL

The improvement of JES for infectious diseases by making, testing and researching the quality and quantity of data enables application through the installation of new modules into already existing

software applications for electronic charts in health centers. The application is desirable for the health care institutions and the chosen physicians in the field, because it releases them of certain jobs that they consider as administrative and at the same time allows:

- Increasing quality and improving the surveilance of certain infectious diseases in the population by providing better assessment of the epidemiological situation and identifying the most vulnerable population groups,

- Timely diagnosis and better treatment for patients, as time for examination and counseling is released,

- discovering certain rules, laws, and relationships in medicine by analyzing large amounts of data using DM techniques.

VII. CONCLUSION

Data mining refers to the collection of information from the data. It includes planning of data collection procedures, data management, execution of conclusions from numerical and descriptive results and presentation of results.

VIII. ACKNOWLEDGMENT

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Technical Aspects of Task Complexity in Corrective Maintenance: A Model and Implementation

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Abstract - **Corrective software maintenance relates to reactive modifications of software products used by clients. Corrective maintenance tasks are triggered by maintenance requests. Task complexity analysis is important for planning and organizational activities in software companies, especially in small ones, in which programmers are fully dedicated to solving everyday tasks. This paper presents a study conducted in a micro software company, aimed at developing and implementing a preliminary model of task complexity in corrective maintenance. Data analysis is based on historical data extracted from the company repository of tasks and subjective evaluation of technical aspects of task complexity for maintained software applications. Results indicate that more complex tasks, with larger variance in task complexity, are associated to more complex software applications, and that more complex tasks are usually solved by more experienced programmers. The presented model provides the basis for future, more accurate and reliable models for maintenance task complexity and improvement of task management.**

I. Introduction

It has been recognized in literature and confirmed in practice that software maintenance costs are between 50% and 90% of total costs associated to software systems [1][2][3], which indicates the importance of software evolution and maintenance for software engineering practice from both engineering and economic point of view. Developers and managers consider maintenance requests as short-term tasks that should be done as quickly as possible [4]. Effective software maintenance is challenge for software organizations since it is influenced by several factors such as [1]: limited resources, quality of existing software systems that should be maintained, inertia and resistance to change software systems, and attracting and retaining skilled maintenance staff. According to April and Abran [2], significant maintenance costs should motivate software organizations to measure and improve their maintenance practice.

After initial delivery of products to clients, the main types of maintenance are preventive and corrective maintenance [5]. Preventive maintenance aims to reduce the rate of failure or degradation of the functional characteristics of a product, while corrective maintenance occurs after discovering problems and aims to return the product to the state that enable required operation. Several typologies of maintenance types were proposed in software engineering, starting from the first one proposed in 1976 by Swanson [6], and followed with improved or extended typologies aimed to cover diversity and complexity of maintenance tasks [3][7][8]. Definition of corrective software maintenance in IEEE Standard 14764-2006 is: "*the reactive modification of a software product performed after delivery to correct discovered problems*". Problem management [9], as well as urgent or emergency maintenance [10][11] occur as special types of corrective maintenance.

Complexity, observed from the organizational and technical perspectives, becomes very important issue to consider in software evolution and maintenance since it influences all activities in software life cycle. Accurate assessment of complexity assumes use of appropriate metrics for measuring trends and relations in historical data about software evolution [12]. Due to confirmed influence of complexity on software quality and reliability, Keshavarz et al. [13] suggested that use of complexity metrics from early stage of software requirements leads to fewer failures of software projects [14].

Two types of complexity dominantly influence complexity of software artifacts [15]: (1) structural complexity - expressed in software structure, and (2) application domain complexity - inherited from the complexity of a domain where software is used. For measuring these complexities several metrics were proposed and used in research and practice. In addition, Li and Delugach [15] argued that intellectual effort, as well as human skills and experience should also be included in modeling software complexity. However, the lack of intuitive definitions of complexity metrics leads to problems

in measuring and judging its influence on software artifacts and related processes [14]. Several approaches have been defined for struggling with architecture complexity of software products, but majority of them are focused on software development activities [16]. Bouwers et al. [17] investigated attributes of software architecture, and among them complexity of stored procedures and triggers, and complexity of software modules, which influence maintainability of software systems. Although complexity in software engineering has been mostly investigated as computational complexity, psychological complexity, and representational complexity [18], Cardozo et al. [19] suggested considering complexity of processes (including activities and tasks) to get more complete insight into practice.

II. CASE STUDY

The study was conducted in an indigenous micro software company [20] that develops and maintains business software applications for local clients. The company has 48 software applications and modules that are developed and maintained by 6 programmers. The aim of the study is to analyze trends in corrective maintenance tasks and how corrective maintenance tasks complexity influence programmers' workload.

Data analysis is based on data extracted from local repository of tasks in the company. For the period of 19 months in 2013 and 2014, totally 2293 tasks were extracted, while 2036 tasks were categorized as maintenance tasks. In [21] categorization of maintenance tasks is proposed, in which 24.02% of all maintenance tasks are categorized as corrections of existing software applications. Due to the importance of corrective maintenance for proper functioning of software applications at client side, and significant share in all maintenance activities, this study is focused on technical aspect of task complexity in corrective maintenance in the company.

A. Corrective maintenance task trends

Corrective maintenance tasks (CMT) were performed on 34 software applications or software modules. Historical data about corrective maintenance tasks were extracted from local company repository for tracking tasks. Each task is associated to a maintenance request (MR).

For the analysis were selected 5 software applications that have more than 5% of total number of tasks (or MRs). The distribution of CMT on all software applications is presented in Table I. Other 29 applications consume together 26.58% of all CMT (approximately less than 1%

per application), which is a negligible number for further statistical analysis.

Tracking the work on solving MRs includes the following types of working hours: (1) Working

TABLE II. DISTRIBUTION OF WORKING HOURS IN CORRECTIVE MAINTENANCE TASKS PER SOFTWARE APPLICATIONS

Application	WHC	WHI	WHCS	TWH	WH Share
Application 1	23.5	44	41	107.5	15.66%
Application 2	23	28	17	68	9.91%
Application 3	40	44	64	148	21.56%
Application 4	7	14.5	15	36.5	5.32%
Application 5	14	59.5	47.5	121	17.63%
Other applications	45	97.5	63	205.5	29.93%
TOTAL	**152.5**	**287.5**	**247.5**	**686.5**	**100.00%**

Hours in the Company (WHC) - solving requests in the company, (2) Working Hours at Internet (WHI) - solving requests by accessing the client side via the Internet, and (3) Working Hours at Client Side (WHCS). The Total number of Working Hours (TWH) on all maintenance tasks is recorded as the sum of these three types of working hours:

$$\text{TWH=WHC+WHI+WHCS.}$$

Total number of working hours for all applications (489 tasks) is 686,5 hours, while the

TABLE I. DISTRIBUTION OF CORRECTIVE MAINTENANCE TASKS ON SOFTWARE APPLICATIONS

Application	No of MR	% of MR
Application 1	89	18.20%
Application 2	48	9.82%
Application 3	97	19.84%
Application 4	28	5.73%
Application 5	97	19.84%
Other 29 applications	130	26.58%
TOTAL	**489**	**100.00%**

selected 5 applications consumes 481 working hours, which is 70.07% of total number of working hours in corrective maintenance. Distribution of working hours per application is presented in Table II. It is evident that other applications consume 29.93% of total working hours, or approximately 1% per application.

These trends related to distribution of MRs and working hours justify the decision to implement task complexity analysis on the selected 5 software applications.

B. Task complexity model and implementation

The technical complexity of tasks in corrective maintenance is based on subjective measures defined by the company manager and on the data extracted from the company repository of tasks. Since corrective maintenance task assumes modification of a software application, task complexity is influenced by the technical complexity of a software application and the complexity of a MR that triggers the task.

Since there is no evidence in local repository of tasks about the exact technical changes in software applications based on MRs (number of changed modules, lines of code, classes, fields and methods), for modeling technical complexity of a software application subjective measures of complexity defined by the company manager (the most experience programmer with 27 years of experience in industrial practice) are used. For each software application the following complexity measures of technical complexity are defined:

- *Architecture Complexity* (**ArchCompl**). It reflects overall complexity of modules and relations between them in a software application.

- *Size Complexity* (**SizeCompl**). It reflects complexity related to the size of a software application (number of modules, files, classes, database).

- *Data Complexity* (**DataCompl**). It reflects complexity of data base (entities and relations).

- *Domain Complexity* (**DomCompl**). It reflects complexity of a real domain where a software application is used (entities, terminology, processes, people).

- *Technology Complexity* (**TechCompl**). It reflects complexity of technologies (software, hardware) used for implementing a software application.

For all software applications, each of these complexity measures is evaluated by the company manager. The values assigned to complexity measures are from the set of values: 5 - *Very high*, 4 - *High*, 3 - *Medium*, 2 - *Low*, and 1 - *Very Low*. The complexity measures for the selected five software applications are presented in Table III.

The complexity measure of MR Description (MRD) is actual complexity of a task description. The complexity measure is based on the Length of a MR Description (LMRD), and it is expressed in the number of characters in the description. For all MRDs in the repository the maximum length (**maxLMRD**) is 1845 characters, while minimum length (**minLMRD**) is 9 characters. Normalized values of LMRD complexity (**normLMRD**) is calculated with the following formula:

$$normLMRD=(LMRD-minLMRD)/(maxLMRD-minLMRD)$$

Previous formula translates all LMRDs in the interval [0,1]. Since description of each MR is usually stated by using domain terminology used by clients, with elements related to technical and technological details of implementation, this normalized value of MR description moderate the total task complexity of a selected software application. Therefore, Total Task Complexity (**TTCompl**) can be calculated with the following formula:

$$TTCompl=(ArchCompl* SizeCompl* DataCompl* DomCompl* TechCompl)*normLMRD$$

For the extracted data and defined subjective complexities for all software applications, the mean (MEAN), standard deviation (STDEV) and coefficient of variance (CV) of task complexity can be calculated [22], which is presented in table 4. In addition, the minimum (MIN) and the maximum (MAX) values of task complexity for each software application are presented in Table IV.

Distribution of task complexity per programmers for 5 selected applications provides more details about the distribution of workload in the company. Since some programmers have a small number of MRs for some applications, which is not suitable for meaningful statistical analysis, statistical analysis is performed for groups of programmers based on their experience in industry. In the first group are senior programmers, where belong three programmers, each with over 15 years of experience. In the second group are junior programmers, where belong also three programmers, each with less than 5 years of experience. Spread of corrective maintenance task complexity for senior and junior programmers is presented in Table V.

The mean (MEAN), standard deviation (STDEV) and coefficient of variance (CV) of task complexity for groups of programmers revealed that senior programmers solved more complex task than junior programmers. Values for senior programmers in the case of Application 4 are omitted since there is only one task in that category, and there is no sense to do any statistical analysis.

TABLE III. SUBJECTIVE MEASURES OF COMPLEXITY DEFINED BY THE COMPANY MANAGER FOR THE SELECTED SOFTWARE APPLICATIONS

Application	Architecture Complexity [ArchCompl]	Size Complexity [SizeCompl]	Domain Complexity [DomCompl]	Data Complexity [DataCompl]	Technology Complexity [TechCompl]
Application 1	5	4	3	4	4
Application 2	3	4	3	2	1
Application 3	5	5	5	5	5
Application 4	3	3	2	2	2
Application 5	5	5	5	5	4

C. Discussions

Model of task complexity presented in the previous section revealed that applications 2 and 4 have the lowest values for task complexity, which is the consequence of assigned values for technical aspects of complexity presented in Table IV. Corrective maintenance tasks for these applications also consume significantly less working hours than other analyzed applications. The complexity of tasks for the Application 3 is the highest, which is expected due to the highest ratings of the technical aspects of the complexity outlined in the Table III.

Data presented in Table IV revealed that coefficient of variance (CV) is over 100% for all applications except for Application 4. Based on these values for CV it is quite hard to predict potential values of task complexity for further corrective maintenance tasks. For Application 4, the value of CV is 48.86%, which enables more precise predictions for future tasks.

Data presented in Table V. indicate that senior programmers solved more complex tasks than junior programmers for Applications 1, 3, 4 and 5 (based on the MEAN values in the Table V.), while only for Application 2 junior programmers solved

more complex tasks. This difference is especially evident for Applications 1 and 3, in which cases tasks solved by senior programmers are more than twice as complex as tasks solved by junior programmers. This analysis confirms the importance of professional experience for solving more complex tasks.

III. LIMITATIONS AND VALIDITY OF THE STUDY

This study has some limitations that influence reliability of obtained results. The most important limitation is a very simple mathematical model for calculating task complexity. The aim of using this simple model is to do preliminary data analysis and identify directions for incremental improvements of the model. Further research will address this limitation by including more parameters that influence task performance and by using more complex mathematical models.

The second limitation relates to the time dimension of the study. By including longer period of observation, it can be possible to get more data for analysis and avoid situations that some segments of data analysis cannot be performed due to the lack of valid data (see analysis of task

TABLE IV. MEASURES OF SPREAD FOR CORRECTIVE MAINTENANCE TASK COMPLEXITY FOR SELECTED SOFTWARE APPLICATIONS

	Application 1	Application 2	Application 3	Application 4	Application 5
MEAN	65.76	5.65	233.13	4.70	145.47
MIN	6.27	0.43	15.32	1.18	9.53
MAX	339.87	46.35	1545.48	9.69	1112.47
STDEV	66.36	7.91	243.51	2.30	204.84
CV [%]	100.91	139.98	104.45	48.86	140.81

TABLE V. MEASURES OF SPREAD FOR CORRECTIVE MAINTENANCE TASK COMPLEXITY PER GROUPS OF PROGRAMMERS FOR SELECTED SOFTWARE APPLICATIONS

	Senior programmers			Junior programmers		
	MEAN	STDEV	CV [%]	MEAN	STDEV	CV [%]
Application 1	93.61	94.23	100.66	51.60	40.46	78.41
Application 2	5.19	7.85	151.31	5.88	8.05	136.94
Application 3	354.03	319.92	90.37	186.50	67.38	36.13
Application 4	-	-	-	4.71	2.34	49.70
Application 5	151.57	186.36	122.95	141.54	151.95	107.35

complexity for senior programmers related to Applications 4 in Table V.).

The third limitation relates to treatment of data that significantly deviate from typical values (outliers) [23]. Proper treatment of outliers requires preprocessing of quantitative data [24], and can contribute to more precise data analysis, resulting with more reliable results that will be used for assessment and improvement of task performance.

Validity of software engineering empirical studies is usually judged in terms of internal and external validity [25][26]. Internal validity relates to definitions of used variables and set of possible values, reflecting how they influence data analysis and results. The main threat to internal validity is roughly defined set of values for types of technical complexity for software applications, which obviously influence obtained results. This treat resulted with no correlation between task complexity and spent working hours. Since this paper presents preliminary experimentation with the data set and different types of models, this threat to validity will be addressed in further research with more accurate data sets and models for task complexity.

Regarding external validity, the main issue relates to generalizability of results and conclusions. The model is tailored for the selected micro software company and can be classified as context-driven empirical research [27]. However, parameters used in the model, with some adaptation, can be used in other software organizations for describing task complexity in software maintenance.

IV. CONCLUSIONS

Due to the obvious importance of software maintenance practice for overall business performance of a selected micro software company, it is important to analyze maintenance tasks and define reliable models for task complexity and relations between task complexity and other parameters of business activities. Further, since corrective maintenance helps in solving user requests, in some cases very critical and urgent, analysis of corrective maintenance tasks becomes important for planning daily activities and long-term maintenance strategy in the company. Proposed preliminary model was developed for initial analysis of corrective maintenance tasks and includes quite roughly defined parameters. Nevertheless, the model revealed large variations of task complexity for selected software applications, depending on the description of analyzed maintenance requests. In addition, data

analysis based on the proposed model indicates that more complex tasks are scheduled to more experienced programmers.

Despite limitations stated in the previous section, this study presents analysis of corrective maintenance tasks' complexity that can be used as a basis for developing a more detailed model for task schedule and optimization of workload among the programmers, which is challenging task in small software companies.

Several directions can be suggested for further work. The first, and more than obvious direction, relates to improvement of the model by including additional parameters that more accurately describe task complexity. In addition to new parameters, more experimentation is needed with different mathematical formulas for modeling task complexity. The second direction relates to implementing improved model to other types of software maintenance tasks (adaptive, enhancive and supportive) in the same company, or in other software companies. The third direction relates to modeling human factor as an important factor in all tasks in software engineering practice.

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Professionalism and Role of Teachers in Achieving the Modern Objectives of Education

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Abstract - The social values and philosophy that changes and educational reform are seen from the aspect of extending the professional role of the teacher to research are pleaded for the reconstruction and redefinition of the typology of the teacher's role - transmissive to a critical or constructivist teacher. They plead for the role of teachers in the modern concept of education through modern educational goals. The aim of this paper is to present this new role of the teacher in the realization of modern educational goals.

I. INTRODUCTION

The purpose of elementary school is to provide pupils with the knowledge necessary for high school enrollment that responds to their abilities and interests, and high school to prepare them for enrollment in a college that suits their abilities and interests. Result: Another resident is located in the appropriate production category, just as our culture was designed. Leaders of the society, and so do the teachers, carry out this categorization process and with all the freedom we are talking about, we are left with the freedom to choose between the categories already offered.

"Teachers use the "group","group process"and "climate" as a resources of manipulating children for their own, predetermined goals. The advancement of children is compared to the ideal of culture they are surrogate [1]. We do not want to say that education for future occupation in life is bad in itself. It is bad if it is a goal for itself. The goal should be to educate a good man, not a good worker (about any area of activity to be done). If this employee will perform his job in a lazy, uninterested or unfair way, then we have not even achieved the goal of shaping a good employee.

Although it is possible that an employee, even because of the fear of losing his job or the consequence of his job doing high quality, means that he is a satisfied man? No, because he is obedient to the repression of the employer or his own conscience, not because he so desires and decides so freely. "The possibility of human civil society and social order does not depend on external, constrained (and perhaps exuberant) structures of power, but on the degree of individual rational understanding." [2].

So it is obvious that education should develop a rational understanding of the individual, which is almost completely opposed to current tendencies. Neoliberal capitalism is not based on the rational, but irrational element of the human being, because the actual needs are not important, but the created desires.

While even the marketing industry, prior to the development of neoliberal capitalism, "treated people as rational beings, neoliberal capitalism has led to a change in mentality from the culture of need to a culture of desire. Human desires need to conceal objective needs, desire is a determinant of contemporary consumers." [3]. Here we see that, apart from the fact that society wants producers, it also wants consumers, and consumerism thus becomes the basic determinant of our culture.

II. TEACHER CHARACTERISTICS

The syntax of "teacher characteristics" at first sight seems common and very familiar. However, research has shown that under this syntax many of them imply very different things. One is seeing a teacher's personality, other qualities related to his profession, the third value or moral quality, and so on. From 1920 to 1930, a strong pedagogical movement developed in Western Europe, which sought to establish a new pedagogical discipline under the name pedeutology to deal with the characteristics of teachers [4].

This movement failed to shape pedeutology as an independent scientific discipline of pedagogy and this idea was abandoned in the thirties. One of the main reasons for this is that psychology did not have a developed complex and flexible personality theory. Later, and especially in the second half of the twentieth century, a growing number of perceived personality theories developed in psychology, but none of them could meet the high complexity and flexibility criteria. In addition to

this, we can interpret unobtrusive pedeutology as well as the complexity of the subject matter of its study. Namely, this discipline was supposed to study the characteristics of a teacher and these attributes are wider than the notion of personality characteristic because teacher traits include traits of the teacher as personality, and the trait of personality traits does not include professional traits such as teacher characteristics or policeman characteristics.

The position, roles and tasks of teachers in the modern educational process and the educational system are differently viewed in the context of the modernist (objectiveistic-Cartesian) and postmodernist (constructivist) paradigms. Different approaches to the conceptualization of the teaching profession are founded on different models of learning and teaching within which appropriate teacher models are developed. Theoretical-conceptual assumptions and models of teacher roles have many implications, most important of which are the methodology of researching the role of classroom teachers, the role of teachers in changing the education system and school reform, and the curriculum of teacher education.

III. ACHIEVING THE ROLE OF TEACHERS IN THE MODERN EDUCATIONAL GOALS

Unlike many other professions in which professional activity is realized by complementary communication (doctor-patient) and by technical action by which theoretical knowledge is applied more or less unambiguously (eg, medicine-surgery), the teacher's action is realized by the symmetrical communication of actors (teachers and pupils), social interactions of subjects, and mutual interpreting of these interactions. In relation to the technical type of action (instrumental action), the teacher's communication activity is immensely complicated because he has to simultaneously link two different discourses - theoretically and practically.

The teacher's profession makes a more complicated fact that theoretical discourse does not make the whole entity a subject-methodological-disciplinary one. It can be said that this is a bunch of theoretical discourses: pedagogical, didactic, psychological, sociological, discourse of the substantive science of the subject (mathematics, physics, philology, history ...).

Furthermore, due to the diversity of scientific and practical discourse theoretical and scientific knowledge can not be directly applied in classroom situations. Theoretical and scientific knowledge of learning and teaching have different degrees of abstractness, so teachers can not directly apply them in classroom situations without the analysis of classroom reality. The teacher is unable to associate a specific scientific setting with a specific class situation. Theoretical knowledge of the lower degree of abstraction, that is, those involving situational aspects, teachers are easier to apply in practice.

Basically, due to the diversity of scientific and (class) practical discourse, theoretical and scientific knowledge is translated into practical discourse by designing and developing personal educational-teacher's philosophies. Future teachers, on the one hand, integrate theoretical knowledge into personal educational philosophy with university study and, on the other hand, far more to the development of personal philosophies are influenced by previous educational experiences and experiential learning during practical work. In accordance with personal philosophies, teachers perform a double interpretation: they interpret the classroom situations and the scientific theories they assume are relevant to the particular teaching situation.

The problem of interpretation in the broader theoretical context is formulated as a problem of intermediate-level consistency. Given the fact that the implicit theories of teachers or educational philosophy differ from official theories (objectivism / constructivism) and in fact represent their interpretation within the personal beliefs and the knowledge of the teacher, the personal educational-educational philosophy of the teacher is a functional link that links the practice with the theory . Personal pedagogy of the teacher determines the teacher's perceptions of class events, judgment, interpretation, and practicing, affecting the definition and constitution of teachers' roles and the way in which they are taught.

Given the fact that most classroom situations can be defined as poorly structured, insufficiently clear, multidimensional and similar implicit pedagogy of teachers, they have the function of teacher orientation and attributing meaning to vague classroom situations. Action research is the formalization of such learning and therefore the problem of development, change and application of personal educational-philosophies of teachers in classroom situations is the central problem of action research.

IV. PROFESSIONALISM AS AN IMPORTANT FACTOR IN ESTABLISHING THE MODERN OBJECTIVES OF EDUCATION

Group routines systems and norms consist of developed, stabilized and conventionally used social interaction methods that are used daily and encompass all social and academic aspects of classroom life (use of space and time, search and information, startup or change of group activities, how members realize their roles and the other). The social construct of the convention constructs a set of expectations about the role of members and social patterns of participation in a common life and enables predictions of group life. Unconventional behavior is immediately perceived by group members, and the specific group dynamics depends on whether to be routinized or negatively evaluated and supported. The development of routines and conventions is an integral part of the development of the classroom social system. The influence of the teacher on introducing routines and conventions on classroom social and academic processes is not ambiguous. Therefore, they are related to the personal educational-teacher philosophies of teachers.

Understanding the common or patterned ways of interacting with others makes a discourse system, and knowledge of the ways of constructing, using, and answering speech and written class texts and other teaching resources make the interpretative system [5].

The basic implication of constructivist pedagogy on the subjective construction of the classroom reality is that the role of class process actors - teachers, pupils and groups is constructed, defined, reconstructed and redefined during the classroom learning and teaching process. Singular generalizations of the role of a teacher of disciples, peers, and the like are not justified in the sense of constituting a universal, rigid and unchanging repertoire of behavior that make these roles. It is more reasonable to talk about the range of class roles and the range of expected behaviors that can create social roles in the classroom.

In the background, the perceptions of the role, their variability, and the set of behaviors of preferred social philosophy and value determinations which, as a more or less related context, make the social background of public education. What he expected of a teacher yesterday is not expected today, and tomorrow will be expected something else. Bearing in mind the above, from the point of view of the social construction of the classroom life, research attention is justified in the classroom everyday life

and by its research it is possible to discover the knowledge about the processes of learning and teaching or public education.

The personal educational philosophy of the teacher and the appropriate classroom practice are the narrowest framework for the development of so- fundamental, situational, contingency, context or practice of close theories that explain the class reality. The development of these theories is still, in particular, from the methodological point of view, approaching orthodox, underdeveloped in terms of questioning of scientific dignity, exactness and so on, which can be interpreted by the lack of reception of epistemological implications of Haisenberg's theory of indefinite (in physics), non-recognition of the implications of chaos theory and complex indeterministic systems and fuzzy logic in pedagogical methodology. The assumptions about the multiple realities of the classical reality and the importance of the ethnographic method in the study of the classical reality that are truly perceived, articulated, interpreted and reconstructed are not accepted.

In the development of the theory of this type, the teachers, pupils and the pupils' group play the main role, and they are implicitly underestimated in the sense of their competence to deal with research as an integral part of the teaching profession [6].

As teachers understand the notions of knowledge, learning, and teaching, the theme that attracted the attention of researchers to the attention of the last decade of the 20th century. The influence of epistemological beliefs and personal educational-teacher philosophies on solving various problems in classroom situations, developing teaching strategies, introducing curricula, using sources of knowledge, and other issues is of great interest to researchers [7].

Among them there is no basic terminological-conceptual consensus, so Pajeras rightly speaks of the inadequate conceptualization of beliefs and their structure [8].

Different terms apply: personal educational pedagogical philosophy, implicit pedagogy, folk pedagogy, epistemological beliefs, implicit theory of the teacher etc. However, summing up knowledge of the epistemological beliefs of teachers can be concluded that these beliefs serve in the general guidance of teachers in the world of school, as cognitive mapping for teacher orientation, represent personal knowledge and theories of teachers, enable decision-making in classroom situations.

J. Calderhead identified 5 categories of epistemological beliefs of the teacher:

- beliefs about pupils and learning,
- beliefs about teaching,
- beliefs about the subject,
- beliefs about teaching of teaching, and
    - beliefs about the role of teacher in teaching children [9].

Based on the exposition, a work definition can be accepted according to which teachers' beliefs represent a system of personal and professional knowledge that serves as implicit pedagogy and cognitive mapping to gain experience and professional experience.

Based on the exposition, a work definition can be accepted according to which teachers' beliefs represent a system of personal and professional knowledge that serves as implicit pedagogy and cognitive mapping to gain experience and professional experience.

Schommer (1990) suggests understanding of personal educational-philosophical teachers as a system of epistemological beliefs that consists of five dimensions:

- structure of knowledge,
- knowledge,
- knowledge sources,
- knowledge acquisition control, and
- speed of knowledge acquisition [10].

Teachers who start from naive epistemology believe that knowledge has a simple and clear structure, that knowledge is permanent, starting from the teacher as the authority of knowledge and mediator, holds that concepts are taught quickly, that the ability of learning is determined by the developmental degree of the child. It suggests that teachers starting from sophisticated epistemology in the five dimensions mentioned believe that knowledge is complex and insecure, that they are taught to be graduated and that knowledge is constructed by pupils.

Critical or constructivist learning and teaching model is based on the concept of active learning for which the teacher must create the appropriate stimulating environment in which learners acquire knowledge in different teaching strategies:

- problem solving,
- research,

- critical thinking,
- projects,
- practical work in the community,
- collaborative research etc.

Active research of teachers is led by the intention of the teacher to perfect his / her own practice in teaching a specific subject in the work with a specific group of pupils. They are focused on solving problems that teachers encounter in everyday work or on projects that introduce innovations into work. By developing a school understanding as a learning organization, the potential of action-based classroom research as a human change strategy is set and new potential goals are set: school curriculum development, undergraduate education and teacher training strategies, systematic planning of development to the widest goal - school reform.

Action research of the teacher has features of the spiral-cyclical development process: observation, detection and definition of problems; systematically, in the scientific methodology, the fundamentally collected data; reflection; data analysis; setting a change hypothesis; action planning; action; redefine the problem.

Action research is located within the paradigm of qualitative research as systematic participative research in the classroom in natural conditions, using ethnographic research methods, case study methods, and other methods within the qualitative paradigm of research [10].

There is a need to strive for the professionalization of a teacher's call not only by the mechanical enrichment of his work by introducing a teacher's research role (teacher-researcher, action researcher) but, more importantly, by looking at the role and profession of teachers in the management and development of the public education system through basic, thus radically crossing the edge of the traditional methodology of pedagogical research and opening up the perspective for the emancipatory methodology of pedagogical research. This methodology, on the fundamental level, has to deal with solving the problem of social morality research in political discourse according to the principle - talking about upbringing means talking about everything. No more, no less.

V. CONCLUSION

For too long we considered irrational desires to be somewhat relieving. In fact, it is precisely these that can lead us to the greatest slavery we want uncontrollably because we have not developed the

appropriate rational apparatus that would categorize our desires as purposeful or incongruous.

By developing rationality, or understanding the meaning of what it does, man's behavior goes beyond mere instrumentalism, and becomes intrinsically motivated treatment reinforced with the confidence that what works is good because it is meaningful. Then he will not only be a good employee, but also a good citizen, friend, cousin, spouse, parent, and all of it free and self-willed. This is the broader view and the higher goal of the educational process that all of us, and especially teachers, should keep in mind.

Professionalism and the role of teachers in realizing modern educational goals should just strive for the above. It should encourage students to educate them in a rational spirit, not sketch their nature, and to make sure that it remains in the domain of contemporary education, that is, rational cultural requirements.

Certainly, the task of this teacher is very difficult, however, in the spirit of education we are obliged to do this in order to improve the existing role of the teacher.

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Cloud Solutions for Creating Mind Maps used in Technological Education

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ABSTRACT

The paper discusses the didactic and technological aspects of cloud solutions for creating mental maps. Mind Maps are seen as an adaptive tool for planning, organizing, creating, presenting, solving problems, such as communication and a method of memorizing information, making them a powerful tool for visualizing processes and occurrence studied in technology education.

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The Power of Media as a Tool in Creating Ethnic Conflicts

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Abstract - Fundamental purpose of the media is to distribute information in such way that allows for the recipient to have objectivity in perception and interpretation and freedom in making decisions based on received information, or event. This can be repressed in favor of gaining legitimacy and support for projects and ideas of ethno political leaders.
With the help of media, public opinion is shifting very quickly, changing it to ones that are exclusive and intolerable to other ethnic groups. Media indoctrination has a task to convince own people in evil character of other ethnic group without trying to understand political actions of that group. Fear initiated by media from own vulnerability and the fear from own ethnic group mobilizes members of certain ethic group to conflict with other ethnic group.
Aim of this paper is to explore the role of the media in shaping, explaining and justifying ethnic conflicts
Tags - ethnic group, ethno politics, indoctrination, homogenization, mobilization

I. INTRODUCTION

Using narration, images, sounds, and spectacles helps to produce the fabric of everyday life, dominating leisure time, shaping political views and social behavior, and providing the materials out of which people forge their very identities. The media creates model to determine how man, woman, either success or failure, what is weak and what is strong - should look alike. By forming opinion about classes, ethnicity or race, nationality or sexuality, media shapes social values and dominant views. (Kelner, 2004.)

The power of media and its ability to achieve political goals have been discovered in its early ages. Media can play significant role in creation and management of socio-political crises and conflicts if it is used by political elite.

II. POWER OF MEDIA

Influence of the media and its power is studied by philosophy and sociology of the media. Guenther Andreas (1996) sees media ontology as a dialectal relationship between phantom and matrix world that fulfill each other. According to Andreas, initial event for media is „raw material "that passes through media filter, gets reproduced and at the end is sold as commodity. Technology, or its matrix is conditioned by the mature of the media. This reality structured matrix produces phantom representation of reality, and they are in fact its own reflection of reproduction prepared by media matrices.

Juergen Habermas (2007) Declares, with political and social power, importance of media power as a new capital, strategically meaningful for functioning pluralist community. Into normative theory introduces deliberalization, explaining that interaction between state and its social environments enable communication channels that filter out political demands and ideas. Under pressure of prejudice, stereotypes and ideology, manipulation, misinformation, information itself can very easy loose its meaning. That way power centers can diffuse desired images about society allowing authorities to create behavior and offer solutions.

Functional approaches tries to establish contribution of a media communication system as whole, emphasizing following media functions. 1. media increases its reputation and authority of individual or groups by legitimizing their status, 2. They enhance social norms, and in some cases they act dysfunctional so they can cause disagreement and passivity. In that sense Kunczik and Zipfel emphasize that the most social functions of media are to inform, creating public, function of articulation, critic and control, socialization, education, integration, recreating, economic function and function of mobilization within political campaign, wars, economic growth, in world of work and religion. (Kunczik and Zipfel, 2006: 37-38).

Observing relationship between media and social changes, there is a question if media can stimulate social changes and if media itself is result of social changes. In quest for answer, Karl Erik Rosengren (1981) has developed three types

of relationship between mass communication and social changes:

1. Mass media and social changes are mutually independent
2. Media influences social changes
3. Social changes defines media
4. Mass media and social changes are mutually dependent.

Media sociology observes media as main factor in transformation of society. In an individualistic society, everyone is seeking to meet both needs, individuality and collective relationship, and this is what media does so well.

Involvement in all local, regional and world events it is not as positive as it feels at first glance. Culture theorist Susan Sontag radically criticizes mass media because of indifference effect toward suffering and creating information about scenes of war, violence, and accidents which become normal part of media content.

Constant exposure to television violence destabilizes viewer who needs more and more violent stimulants. With that in mind Michael Kunczik and Astrid Zipfel (2006) set thesis named habitulization in which recipient reduces ability of empathy like compassion to victims of a violence. Violence starts to feel normal, becomes tool to sort out conflict, everyday behavior. Simplified tolerance towards violence becomes smaller, so small that we become violent.

Max Horkheimer and Theodor Adorno (1989) criticize standardization and production of serial media content that mold „standardized" people. Guy Debord (1999) lays down theory of spectacle as continuing discourse of imperial ideology about himself. Loise Althuser (2009) talks about idealistic apparatus (press, radio, tv, etc.) witch lead to overwhelm every citizen with daily doses of nationality, chauvinism, liberalism, moralism... subordinate individuals to political ideology of the state.

III. MEDIA AND POLITICS

Media and politics are interacting and they are depending on each other, so there is belief that freedom and neutrality of media is just a good story. Noam Chomsky (2002) explains that the most effective way to control people is by controlling their thoughts. Ideas lead to actions, so they should be kept under control. Chomsky reveals the role of the media in the overall system of control and surveillance. He thinks that media

plays a crucial role in the system of indoctrination, which teaches us how to behave, what we should think and advocate. Ideological managers carefully define different thinking strategies. The elite have monopoly over ideas, thus forming the overall perception of political reality. Main target group, claims Chomsky, is the uneducated group. Majority of the population. It must be neutralized by emotionally potent simplifications. This means that ideal social entity is occupied by something without content, ideological connotation that is supplied by media. Political elite cannot exist without certain persuasion and mind control by which public opinion turns into confused and passive observers. Chomsky argues that regardless of the strength of the military and the skill of secret service, it is naive to believe that those type of physical persuasion is sufficient, it is crucial to ensure the consent of people by indoctrination.

Explaining relations between media system and politics system, Michael Kunczik and Astrid Zipfel (2006) point out that there are different methodological approaches that can be categorized into following paradigms: *Paradigm of power-sharing, paradigm of instrumentalization/dependence and paradigm of symbiosis.*

The power-sharing paradigm starts with the premise that the media carry out the function of criticism and supervision. In this context, media is understood as the „fourth power"with the function of controlling legislative, executive and judicial power. To be able to accomplish that function, all media should be independent. A media that is clearly separated from politics can legitimize the political system.

According to instrumentalization paradigm, media becomes dependent on politics. Politics intentionally tries to guide media and its political functions to their own political advantage. The political system inside media sees significant potential of guiding. Increased interest of politics for media and media reports is based on increased demands and problems of political system with simultaneous resource constraints, especially financial, for their realization. Political elite uses media as immaterial and symbolic construction that should give impression of competent and problem solving. According to Hans Mathias Kepplinger (1983), the possibility of political actors to directly address to the population is limited. Access to public has largely become dependent on mass media (hence the paradigm of

instrumentalization is called the paradigm of dependence). A key place in political processes in taken by media, because, not only they comment and criticizer political decisions, but they also report them, and prepare. In that way media define framework in which decisions are held to be acceptable and becomes factor that affects legitimacy and the implementation of political decisions.

Symbiosis paradigm suggests that there is dependence between political and media system, it leads to creating a cluster and super system. Symbiosis is more common today, and seamlessly explains the principle of democracy on division of power. There is no clear distinction today between generating politics and political intercession. Political system becomes more and more media, and media becomes more political. Super system becomes more introvert, and it keeps distancing itself from people's interest and needs.

Apart from the paradigm of power-sharing, all other paradigms start from moving or deleting boundaries between media and political system. Consequence of this type of development on one side events get increasingly dramatizing in order to make certain reactions to the recipients (citizens, public). On the other hand, public gets numbed by exaggerated media content. Between the policy-making process during decision making process that is presented in reporting process, there in increasing gap, the gap that opens up to the democratic system that creates kind of legitimacy stance in which democracy comes first, because public gets inaccurate picture about politics, on which expectations cannot be fulfilled. (Sarcinelli, 1994: 36).

As Molutinović and Todorović like to point out, there is constant evidence of malicious use of media from centers of political power by blurring, hampering and blocking the process of objective reporting and qualified decision making. They like to point out there is a pressure inside political power on the media to act on political views by various methods: financial pressure, by placing certain journalist inside media, by manipulating and disqualifying media themselves in the public. (Milutinovic and Todorović, 2017: 29).

IV. MEDIA MODELING, EXPLANATION AND JUSTIFYING ETHNIC CONFLICTS

Asim Mujkić (2010) explains that, unlike regular democratic political communities, that are based on accommodation conflicts and opposing interest of various social groups, ethnopolitan communities are always focused on pure survival of a particular social, or ethnic group. Such existential narrative always implies for mobilization all of the material and spiritual forces that society has, and vigorous action with aim to establish national unity. In fact, this narratives invoke „firm hand", leader as constant awareness-mobility. In that way, every, and even most promising political issues within ethnopolical borders, can be „deciphered" as a „vital", „existential" question. Only within ethno politics, unlike democracy, politics do not practice conflict solving, but rather practice of initiation of conflict, thus ensuring constant flow de-mobilizing force that holds political community, the state, constantly on the edge of the war, or in constant state. Mujkić concludes that crisis generates political power and legitimacy of ethnopolicital elite. (Mujkić, 2010:19).

In that context, media has major role in direct exponents of ethno-political leaders. The media becomes a mean of producing, controlling and interpreting relationship between past and the present. Certain historical events are suppressed, while in the same time some old events becomes a tool for creating new collective memory, as an exceptional element is building new ethnic self-identification, and basis for rewriting, this time more acceptable, national history. All in service of „ethno-nationalist" leaders who have endless amounts of hatred, fear and desire to correct historical wounds and injustices that can be mobilized in people if they wish. (Denich, 1994: 382).

Media indoctrination has a task to convince own people in evil character of their ethnic group, without attempting to understand political views of that group. Fear forced by media from individual threat, and fear from destroying own ethnic group is a powerful tool towards conflict with other and different. Fear of dominating over another ethnic group and fear of assimilation and destruction of their own ethnic group are powerful source of emotion. These emotions are suitable for instrumentalization and abuse. Making a role in creating ethnic conflicts, media is used as a device to construct desired reactions in form of:

a) Collective guilt: 'They' act in unison; children grow into adults; women give birth to future warriors; even old people stab you from behind; 'they' will never change.

b) Revenge and retaliation: 'They' massacred 'us' in the past, and are about to do it again, in fact they have already started. A settling of scores is justified; an eye for an eye.

c) Deterrence/first strike: Disable them before they strike, which is what they are about to do, despite appearances, because they are secretive and treacherous.

d) Danger/survival: These are extraordinary times, one's entire nationality is threatened, and extreme measures are justified.

e) Legitimacy: Ordinary people and militias are justified in taking extreme measures because the constituted authorities have not come to the defense of our people. (Oberschall, 2000:997).

Media messages focus on the threat of own ethnic group through time and space. Reformed history events are used as references for present moment in order to explain current political problems through a modified historical view. The goal is crystallizing their own ethnic identity, by distinct toward each *other*.

With such tasks, media creates frameworks and creates conflicts by forming the character of a conflict debate, media determine who can speak, what kind of arguments can be used in debate, and what kind of language can be used (Jusić, 2003:57).As a politically dependent, media is focused to the intense legitimation of political and war actions using primarily propaganda. Mechanisms of war propaganda, which are successfully used in ethnic conflicts, systematized by Anne Morelli (2004) through ten models of argumentation:

1. *We don't want war! Our choice is peace!* Peace does not have an alternative! Before going to war, leaders like to point out how they are against conflicts and war.

2. *The other guy is the sole responsible for this war.* Leaders, despite of their love for peace, the need for war is explained by the behavior and actions of the other side.

3. *Our adversary's leader is evil and looks evil.* Creating an image of an enemy is a process of creating public opinion in time of preparation and during the conflict. The image of the enemy creates a sense of danger and the need for strong leadership. As the greater danger may be, whether it is real, or fake, the need for stronger leader and greater willingness to accept authoritarian leader becomes. The opponent is stigmatized as unhuman.

4. *We are defending a noble purpose, not special interest.* The goals that really lie behind the conflicts are revealed on rare occasions. In public, however, are quoted as undoubtedly justified.

5. *The enemy is purposefully causing atrocities; we only commit mistakes.* Media propaganda on reporting the crimes is such that the crimes are only committed by enemy. In case of unquestionably proving that the crime was committed by us, then responsibility of a crime gets diminished.

6. *The enemy is using non legal weapons.* This argument arises from previous one and serves to create an impression that own group, in contrast to opposite, respects the rules. This argument is also appropriate for creating a scenario in which we feel threatened.

7. *We have very little losses, the enemy is losing big.* Public support can only be maintained if success is achieved. Therefore, our own losses get minimalized, and opponent losses get exaggerated.

8. *Intellectuals and artists support our cause.* Parties in conflict expect that distinguished persons will support them in order to further public support.

9. *Our cause is sacred.* Religious arguments are happily used to justify conflicts with elements mesianism, prophecy and eschalogy.

10. *Those who doubt our propaganda are traitors.* Ones that doubt in propaganda messages will soon be exposed to criticism that he is not a patriot.

Propaganda was success if, according to Milutinović and Todorović (2017), achieved three goals: a) informed recipients of a message about certain event. B) Influenced on behavior and activity or the recipient. C) Convinced the recipient of the message to change attitude, and persuade offered solutions towards to what media constructor wants.

Tarik Jusic (2003) states that four strategies must be used as frame to explain and justify conflicts: 1) inventing the enemy, 2) inventing the victim, 3) historization, 4) hashing/concealing real problems.

Creating an enemy is fundamental polarization strategy. Simplification and polarization are the core of communication that advocates national homogenization. Such communication reduces reality to duality where all relationships are defined through polarization "us" against "them".

Enemy is bounding tissue of one group with integrative potential of exceptional value. He ensures conditions for collective action, he gives legitimacy to use force, and he homogenizes the group. Finding or inventing of an enemy is prerequisite for homogenizing one ethnic group and precondition for conducting a joint action.

Creating a victim is a war strategy of propaganda that uses constant reports and images of "our" innocent victims and refugees. The goal of such messages is to empower the sense of fear and desire to fight for survival of an individual as a group member. Also, the show what kind of destiny is expected for those who do not want to fight. As Jusić points out, victimization is special phenomenon. Victims are becoming object of glorification and a tool to identify the chosen one, and sacrifices people who must seek justice for their victims. Glorifying victims, whose bodies were taken out of mass graves, transforms dead people into those who incorporated their lives into nation's body, and thus gain immortality through nation. The role of the victim is dual: first, it seeks for vengeance and it justifies as the only appropriate mechanism for achieving historical justice; secondly, immortality is promised to ones that sacrificed their lives for the nation. In this way they are encouraged to fight and give their own lives.

Historization implies for implementation of national history as an interpretative and analytical framework for explaining certain time frame and conflict. Interfering history into present, prevents a rational interpretation of events, and understanding cause and nature of conflict is led by myths and emotions. We are presented with twisted plot of a given moment that even goes through time and past, centuries away from present. This denies authority of any objective interpretation of given event, and legitimacy of a regime cannot be disputed because he acts in boundary of a mandatory historical framework. As such, it cannot be responsible for the events that are, in fact, not caused. All decisions are made elsewhere, and even in other time frame where conflicts begin. Historical threat to group survival is presented as an essential explanation of the conflict, so any attempts to disclose current activities and decisions are irrelevant.

Hushing, or concealing real problems is a way of hegemonic and homogenizing strategy of spreading ethno-nationalist discourse and constructing false realities based on chosen

information. The media draws public attention from everyday problems and point out as nation problems, patriotism, and the enemy. Realizing the role of national self-consciousness, the media ignores the real structural problems and directs the conflict.

Media is more flexible in the process of recruiting than for example, a party. Unlike political actors, they can introduce some topics into public debate, but also they can exclude them and by keeping focus on some topics and cases, and other ones get ignored. The audience also expects from media to persist on public opinion, or to explain change in their standpoint. In the end, media is free of moral responsibility for negative tendencies, and media's involvement is almost unimaginable. For these reasons, the media, unlike other institutions, are not subject to its legibility (Kunczik and Zipfel, 2006: 59).

V. CONCLUSION

With help of media social processes and indoctrination is coordinated very successfully. Shaping the context of information form political elite in the role of media constructors, they create uniformed public and legitimize their actions. Media constructors are placed as only valid interpreters of social reality.

Ethno policy intentionally seeks to use media functions and media power to their own political advantage. By means of media, the ethno policy forms attitude and beliefs or its ethnically-based members. In media they see an excellent instrument of homogenization and mobilization of their own ethnic group. With help of media value-enhanced presentations from the past in today's time they focus thematically on desired ideological context. They create new, media, reality shaped by imaginative ethno-ideological platform. Media reports are used to define the boundary in which political decisions are considered acceptable and become an inevitable factor to affect legitimacy and implementation of these political decisions.

Creating a role of ethno-national self-consciousness, media tends to draw away public's attention from daily, real and structural problems and directs it to the conflict. The role of the media in constructing ethnical conflicts is strategically important, especially for legitimizing and giving programs and ideas to ethno political leaders, as well as indoctrination, homogenization and mobilization of own ethnics. That way media is uses to explain and justify conflicts that involves

invention of the enemy, victim, historization and suppressing real problems

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Competencies of Principles of Educational Institutions for New Paradigm of Administration

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Abstract - In today's schools, principles are in numerous roles that are more diverse and demanding. The principle is asked to always have a quality solution, both for the present and for the problems and challenges to come. Through the jobs of the director, many factors are intertwined, such as the care of the school development program, connecting the participants, motivation, professional and technical assistance, finances, linking with external institutions, evaluation and self-evaluation, etc. Research has shown that for the performance of a director's job, five key competencies are needed: personal, professional, development, social and action. In a complex process, the principle should encourage creativity, protect the specificity and development characteristics of pupils, take care of the rights and responsibilities of the subjects, and at the same time to adjust the situation to the various forms and regulations imposed on him.

I.   INTRODUCTION

The breadth of knowledge is very important for performing a managerial job. This means that the manager must know to a certain extent the technology and means of work, to know the personality psychology in order to understand the feelings and motivations of those with whom he works, to know the basic principles and principles of economy and finance in order to best deal with the complex economic and financial flows, and to know the legislation.

Of course, he should have knowledge in all those areas that will enable him to be successful in his job. In doing so, managers must develop their creative abilities, communication skills, human resources capabilities, teamwork skills, as well as skills in decision-making and problem-solving systems. Of course, managers must know the total socio-political, economic and cultural environment, in order to be able to adapt, adapt and manage successfully in new, complex and changing circumstances. The education of the manager went somehow parallel with the development of science and technology. In the fifties of the last century, there was a need for permanent education of managers, especially those who worked in the production process. Thus, a period of permanent training of managerial staff was created, through short courses and appropriate seminars.

These seminars have gradually turned into permanent forms of education, which include managers as well. The first business schools were established, as well as the first schools for principles who had a university program. With the rapid development of technology, the need for a more precise definition of the level of education of principles was inevitably imposed. In that sense, the education of principles is divided into systemic and functional education. System education develops the ability to analyze and solve problems, as well as the ability to analyze the part of the system in which the problem arises and all other parts of the system that can be affected to solve the problem. The functional education of the principle is capable of correctly applying the concepts of planning, organizing, motivating and controlling the overall management process. The functional education of the principle is based on the philosophy, theory and methodology of such education.

The basic elements of the philosophy of education of principles are: solving problems and conflicts through learning and development, organizational change strategies and the role of staff training in the introduction of changes, concepts and organization of professional development of personnel, as well as mentoring with each individual or group in order to develop management skills. The basic elements of the theory of functional education of principles are: defining educational needs as an andragogic category and educational needs in relation to motivation of employees, learning theory and

specificity of adult learning, forms of employee learning and simulation of decision and learning situations. Elements of methodology of functional education of principles refer to methodical formation of educational situations, principles of designing educational situations, funds needed for transfer of knowledge, forms of communication in internal knowledge exchange, preparation of didactic knowledge, organization and formation of learning at work and establishing indicators and instruments of valorization of educational results.

Otherwise, the world's leaders are educated in several ways: - Informative Seminars - Basic courses - Executive Development Programs - Postgraduate Business Studies. Today's education of managers in the future will definitely experience certain transformations that will go along with changes in the environment and organization, as well as changes in management jobs. Thus, the education of managers in the future will be matched by new social trends, which go towards the civilization of knowledge.

II. LIDER AND MANAGEMENT ROLE OF SCHOOL PRINCIPLE

The field of work of the principle as a manager at the head of some educational and educational organization is very wide, and it could be divided into two key categories:

- Care for administrative and technical functioning of school work - Within these tasks, administrative tasks related to monitoring and application of laws and regulations, human resources, health care, administrative work with pupils, etc. Of course, financial operations and maintenance activities are of course also included.

- Professional-pedagogical field of activity: This area is specific to school as an organization and is key to the managerial function of the director. The work of this kind includes developmental and pedagogical activities, and some of them are: planning, programming, organizing and introducing innovations, monitoring and improving teaching, working with children with difficulties, professional orientation, professional development, etc.

Principle of school is not always the sole holder of all business, but participates and coordinates most of the jobs. Its function in modern schools is viewed from two aspects: the business-administrative aspect is viewed through the prism of management, and the professional-pedagogical aspect gives it a characteristic of leadership.

A. Principles as liders

Contemporary understanding of good leadership in school emphasizes the principle who takes care of human potential as something that is inevitably and contributes to the quality and achievements in all areas of work. Thinking in this direction, the principle should be more a leader than a manager, but also that he knows well the demarcation of these two terms in his work. Teacher leadership is defined as a set of teachers' abilities as an effective lecturer who, by means of effective motivation, positively influences the working practices of other teachers. In today's schools, cooperation with other teachers occupies a high place in the list of jobs of each teacher. The practice of teachers has long been, and even somewhere today, a relatively private matter.

This in fact means that every teacher has taken care of his own working practice, and the rest did not have any kind of insight into his work, and in this way no one had much benefit from the other. The concept of teacher leadership is trying to eliminate this barrier by encouraging teachers to share their experiences and advice with other colleagues and the entire community of teachers in the world by writing professional papers. "Conducting in a real (essential) sense - a precondition for a reversal in the organization so that it can remain competitive in the constant change of the environment. Leading an organization means directing, communicating with collaborators about common goals, motivating and inspiring. Leadership should achieve a leadership culture in the organization, to initiate the process of learning through challenges"[1].

Managing principles tasks are essential for organizing the daily life of a school and are related to planning, analyzing, organizing and supervising, and leadership-related tasks are related to people, their behavior, style of work, communication and motivation. While management refers to things, leadership refers to people. Managerial style is rational, and leadership is emotional. The principle who is manager often rules people in practice by seeking obedience, and the leaders of the people follow the quality of his personality and on the basis of his own personal choice, because he launches emotions and spreads passions. The manager maintains systems, rely on control, and looks at things in the short term. The

principle's function as a manager is to command and control using formal procedures and rational methods. It is characteristic for them to follow the regulations and business policy of the superiors.

A principle with leader lines is the leader. Leadership is always characterized by the impact on people, their acquisition and encouragement of activity. He motivates, stimulates, gives energy, observes things in the long run and has a vision, provokes the current state of change. In team work he tries to explain the direction of change and acquires members of the organization by participating in the process of these changes. Principles-leaders always follow personal intuition and constantly stimulate innovation.

A person who is elected to the position of director, in addition to his or her education, must possess a multidisciplinary education. A man learns while he is alive and in that sense we are talking about lifelong learning. Practically, the director should work on his own education every day and constantly improve. With the development of technics and technology, and with the advancement of technological progress, we have a constant influence from the environment in education. If the principle is educated and follows new technical achievements, he will, in so much more quickly and easily, enable new technological achievements, innovations to enter schools. In these cases, school is an open form of organization that is ready to accept and apply new ideas.

B. Principles as managers

There are other types of directors who are not inclined to follow the changes in the environment and very difficult to accept changes that occur in the environment. In such schools, educational work, if analyzed, is seen to be of no improvement in quality improvement. Frenchman Hanry Fayol, who was interested in mining engineering, is considered one of the beginners who studied the theory of management. According to him, the management has five basic functions.

The five basic financial mechanisms that exist can be applied to the work of the director, which are: planning, organization, commanding, coordination and control.

- Planning implies a look at the future. School principles must have a vision and mission to achieve their strategic goals in the future. They have to plan what they will do in the future. If this function fails, then the director is considered an incompetent manager. Principle activities: bringing the development plan of the institution; he plans to implement education and training programs and all the activities of the institution; planing professional development.

- The organization of the school principal implies providing all the resources that are considered necessary for the normal process of school work (material, human, financial, teaching space, teaching, heating ...).Principle activities: he organizes the realization of programs of education and upbringing and all activities in the institution and he organizes pedagogical-instructive insights. By organizing his work, the director of the school succeeds: to get rid of unnecessary jobs and to create free time for basic ones; tasks in the management process; 2) to learn what is most important in the work of the school, and to act planned and according to established order; to avoid tension, nervousness and unnecessary rush; to increase the efficiency of one's own work and management; to give initiative and to initiate other collaborators for a more rational and more conscientious execution of tasks; to shorten working hours and to influence the creation of a pleasant and cohesive atmosphere in the collective [2]

- Commanding involves directing pupils and employees by the principle to perform certain tasks and activities.Principle activities: the principle manages the work of the school and creates expert bodies and teams.

- Coordination is synchronization of tasks and activities, in order to achieve the goal, successful results, that is, the quality of educational work of the school. Principle activities: He directs the sessions of the educational, teachers' council, or pedagogical council, without the right to decide, he directs and coordinates the work of professional bodies in the institution, he cooperates with parents.

- Control by the principles implies to check whether the given activities and tasks are realized and to what extent. It can be: permanent and casual. Principle cares about: quality assurance, self-evaluation, attainment of standards of achievement and improvement of educational work; establishing a development plan for an institution; carries out pedagogical-instructive insight and monitors the quality of educational work and

pedagogical practice and undertakes measures for improving and improving the work of teachers, educators and professional associates, follow professional development.

III.   STANDARDS OF PRINCIPLES COMPETENCIES

In order for the principle to successfully manage his role in a wide range of operational tasks, he needs adequate competencies. There are numerous considerations and theories about which competencies and models should be managed by the principle in his office. By analyzing and compacting these models, five basic competences for school principals can be identified as managers. Before they are listed, it is necessary to say that they can not be observed in isolation because they are highly interconnected and conditioned one another. The performance of the manager, therefore, is reflected in five intermittent models, which are: personal, developmental, professional, social and action competence.

Personal competence is the importance of perceiving the behavior and reaction of directors. It includes features such as: honesty, consistency, communicativeness, accessibility, trust, diligence, self-confidence, working energy. Development competence implies the successful conduct of professional and pedagogical development and business operations of the school. Here is the important clarity of the vision, the introduction of numerous innovations into the work, the application of new information technologies, the rational organization of business, etc. Professional competence includes pedagogical, didactical and other expert knowledge necessary for successful performance and improvement of educational process. It is necessary for the principle to know the program of pedagogical work and didactic principles, to know planning and programming, the organization of pedagogical work, educational legislation and evaluation systems. Social competence refers to the field of interpersonal relations such as: knowledge of the law of interpersonal relationships, conflict resolution, motivation of employees, democratic leadership, as well as recognition of quality in the contributions of teachers and professional associates. Action competence focuses on practical work of the principle, both in school and in the environment. It involves good cooperation with teachers, active participation in problem solving, advisory assistance in work, etc.

In addition to the basic conditions established by the Law on the basics of the education system,

a person elected to the school director must have and possesses other facilities. These qualities are divided into four categories: pedagogical; psychological; moral; priority over other candidates.

Persons who are appointed as directors during the studies have little or no practical preparation in the field of school management. These are persons with different profiles of expertise, who possess knowledge and expertise in the field and subject for which they have been educated. Named a person in the position of a school principal in order to be a competitor in order to perform the function of quality, he must have his / her knowledge in the profession, to expand his knowledge in the following areas:

- Human Resource Management;
- Management;
- Economics;
- Labor law,
- Legal frameworks and laws relating to the education process;
- Computer literacy;
- Knowledge of a foreign language.

Numerous competences that each principle should have more and more often in many countries are referred to as the competence standards or the principle's competence profile. As a rich inventory of knowledge, skills, attitudes and values were created as a result of the analysis of educational policy objectives and the empirical research of principles in practice. They are also the basis for the selection, training, monitoring, evaluation and self-evaluation of the principle as a manager.

They also determine the direction and development of direct professional development. Good standards and their application in practice are based on leadership concepts and are development-oriented. The most well-known standards for educational institution leaders are the US Interstate School Leaders Licensure Consttrium ISLLC, highlighting principles as leaders in the educational process that according to their standards are the most competent principles with such a profile:

- He supports the success of all pupils by encouraging the development, harmonization, direction and communication of a shared vision of learning supported by the school community;

- Creates, supports and nurtures such a school culture and program that promotes not only pupil learning but also the professional development of school staff;
- Successfully manages the organization, its functioning, resources, which provide a reliable and efficient learning environment;
- Collaborate with parents and the community, respecting different interests and needs;
- It works reliably, honestly and ethically. In the past, dominant administrative work was dominant in practice, and the action was rigid and expressly regulated by law, emphasizing the excessive administrative and formal function of his work and the work of the school in general.

The complexity of the competences of modern principles today requires the acquisition of appropriate forms of training, some of which are possible before the appointment itself, and other professional training during the mandate. Content that managers need to master, most European countries consider the way that classical principles become transformational leaders who realize the development of their school. This involves building a school vision, defining the goals of the school, supporting creative associates, forming and affirmation of good school practice, creating a climate of high expectations, shaping school culture, encouraging and motivating employees. From the point of view of the role of the principle, the first program bases for the contents of their training were implemented.

Most European countries have organized training for principles after graduation, but in many forms of professional development are still being implemented in the immediate school environment. In the Netherlands, they put emphasis on content that trains managers for human resource managers and reflex practitioners. In Belgium, they seeks to develop teamwork and a creative approach to improving pedagogical work. It is possible to note that in many countries theoretical and empirical research is combined and in accordance with them, the practice of school management is improved. In the Republic of Serbia, the Rule book determinates the „Standards of competence of the principles of educational institutions" [3].

The competencies of the principles are defined as functionally integrated knowledge, abilities, skills and value systems that are the basis for successful performance of tasks and tasks in pre-school, elementary and secondary education institutions.

The competence standards of the principles determine those criteria that ensure the successful management, organization, management, execution and control of the work of the said institutions.

Competence standards describe the key activities for which the principle must be trained to successfully manage the institution and ensure the achievement of its objectives.

The purpose of the Standard is to ensure and improve the quality of work, thus contributing to achieving the general outcomes of education and training defined by the Law.

Indicators are qualitative and quantitative indicators of realized activities within defined tasks.

Assessment of the competence of the principle is done by determining whether his abilities and behaviors listed in the competence indicator are sufficiently present in his work so that it can be reliably concluded that he has a certain competence.

Standards refer to:

- managing the process of education and learning the children in preschool institutions, or managing the educational process at school;
- planning, organizing and controlling the work of the institution;
- monitoring and improving the work of employees;
- development of cooperation with parents / guardians, management authority, representative union and the wider community;
- financial and administrative management of the work of the institution;
- ensuring the legality of the work of the institution.

Standards are given within the six areas of the principle's work and each has a short description and list of indicators that define the competence more precisely and have a higher degree of concreteity. The compliance of the standards is assessed on the basis of whether indicators are met.

Standards and indicators refer to the principles of all institutions, but only within the first field, a distinction is made between the standards

pertaining to principles of preschool institutions and school principals, which corresponds to the differences that exist in the nature of the activities of these institutions.

The standards are applied in the licensing procedure of the principles and represent the basis for the bringing of the training program, the exam program for principles and for self-evaluation.

The standards are harmonized with the Law on the Foundations of the System of Education [4] and other documents important for the field of improving the quality of education.

IV. EXPERIENCE FROM SCHOOLS

By increasing knowledge in these fields, principles become expert in running and managing the school in the direction of achieving higher quality of educational and educational work of the school. Examples from schools show that there are persons who are interested in continuous and permanent learning (lifelong learning) of the jobs for the function on which they are set, while there are also cases that give little attention and importance to improving knowledge in the areas that are necessary and inevitable for position of school principle.

Experience from schools shows that it is better to be an average teacher, whom the pupils will remember the appropriate level of knowledge and expertise, but rather be the principle who will remember pupils and colleagues for ignorance, illegal work, arbitrariness and dictatorship.

In order to carry out the job according to the given criteria, the person appointed as the principle should have the standard competence of the principles in the institutions of education and training to possess the appropriate level of knowledge and expertise. This set of standards has been brought by the National Education Council. The main purpose and goal of introducing the standards of the competencies of principles in the institutions of education and training is that schools are managed by professionals who will carry out their work at a high level.

This contributes to the improvement of education, ensures and improves the quality of school management, which improves the quality of the educational and educational work of the school. The brought standards are used as a further starting point for passing the exam for principles (licensing). For each of the standards, a description is given as well as a list of indicators. Indicators are indicators (quantitative and qualitative) of the activities that need to be realized within defined tasks.

V. EVALUATION OF THE DIRECTOR'S WORK

In assessing the competence of the principle, a person must demonstrate that the abilities, knowledge and behavior listed in the competence indicator are sufficiently present in his work. Based on the previous one, it can be concluded that the principle has a certain competence. Brought standards of competence of the principle's work are divided into six areas and include the following:

- managing the learning process and teaching at school;
- development of relations with parents / guardians, management authority, representative trade union and the wider community;
- planning, organizing and controlling the work of the institution;
- development and management of human resources;
- financial and administrative management of school work;
- ensuring the legality of school work.

The competence standards of the school principals apply in the licensing process of the principle and represent the basic and the starting document on the basis of which the training program and the exam program for the principles should be developed. The basic aim of the existence of the strandard is precisely the improvement of the quality of the work of the school principals, that is, the improvement of the quality of the educational work of the school. The standards and competencies of the principles are a sure and right path to the quality of school work.

Guiding people is the most complex and subtle management function, and it is its purpose influencing people so that they contribute more to the common goal. The means of achieving a common goal must not jeopardize the dignity of individuals, and therefore, the director must treat with respect, regardless of their position at school, as the director has to participate in the achievement of a common goal [5].

A. Managing the learning process and teaching

Managing the learning process and teaching implies that the principle encourages and improves the learning and values of learning in the school,

or within the community. In his work, the principle creates secure conditions, that is, a safe environment, which ensures the quality of the education process and enables learning. It monitors and improves the quality of teaching and upbringing processes for all pupils, respecting their diversity that they possess. The results of the work of the pupils are monitored continuously and occasionally, as well as the activities that stimulate the pupil to work. Here we can distinguish five types of standards that are relevant to this field:

- Developing a learning culture;
- Creating conditions for pupils development;
- Developing and ensuring the quality of the teaching process at school;
- Ensuring an inclusive approach to learning and teaching;
- Monitoring and encouraging pupils achievement.

B. Development of relations with parents / guardians, management body, representative school union and the wider community

There must be successful cooperation between principles and the parent, as well as providing assistance and support to the work of the parents' council. Cooperation between principles, the School Board and the representative school union should also not be missed. Partnership relations should be fostered also towards state administration and local government bodies. In addition to this micro-cooperation, it is necessary to cultivate and develop cooperation at the national, regional and international level. Here are four types of standards, which are:

- Cooperation with parents / guardians;
- Cooperation with the managing body and representative school union in the institution;
- Cooperation with the state administration and local self-government;
- Cooperation with the wider community.

C. Planning, organizing and controlling the work of the institution

Management processes: planning, organization, management of human resources, management and control are performed by all principals in elementary schools. However, the amount of time and effort devoted to each of these processes depends on each director separately. So, for example, associate principles usually spend less time planning than principles. However, they devote a considerable amount of time and effort to

guidance and control. Principles spend a lot of time devoting themselves to planning [6].

Principles provides bringing and implementation of the institution's plans (weekly, monthly, annual). They care to provide the appropriate organizational structure in the school, to assign the activities and the tasks to be radially distributed and occasionally coordinate. Activities and tasks assigned to employees monitor and control the dynamics of execution. In school, he/she provides conditions and it is advisable to update a unique information system with pupils, parent data, as well as data on the institution and employees. At school, he/she develops a quality system and encourages employees to achieve quality educational work. The following five standards are important for this group:

- Planning the work of the institution;
- Organization of the institution;
- Control of the work of the institution;
- Management of the information system of the institution;
- Management of the system of quality assurance in institutions.

D. Human resources development and management

It refers to the number of employees based on the number of pupils and classes, which would be professionally represented. All employees under the same conditions allow and entitles them to professional development and professional development. The school encourages positive climate and good interpersonal relationships among employees. By monitoring and controling, he determines good results and rewards them. This positively influences the quality of school work and motivates everyone else to go through quality. The following four standards can be distinguished here:

- Planning, selection and reception of employees;
- Professional development of employees;
- Management of interpersonal relations;
- Evaluating the results of work, motivating and rewarding employees.

E. Financial and administrative management of the institutional work

It implies that the principle efficiently and reliably manages financial and administrative resources. It is concerned that at school there is complete and adequate documentation which is a

need for functioning of the school. For this group of standards, three standards can be distinguished:

- Financial resources management;
- Management of material resources;
- Managing administrative processes.

F.   Ensuring the legality of school work

In the school, principles ensures that internal instructions and policies are in place in accordance with the law and other regulations. Conditions should be created to respect and enforce laws and other documents issued. Here are the following three standards, which are:

- Knowing, understanding and monitoring of relevant regulations;
- Creating general acts and documentation of the institution;
- Application of general acts and documentation of the institution.

VI.   CONCLUSION

The results of the work, that is, the quality of the work of the school depends a lot on the director. Persons who are appointed to the function of the director, in addition to their expertise in their field, must know and have knowledge from other areas mentioned above. The adopted competence standards of the directors, which were discussed in this paper, represent and demonstrate what knowledge, skills and abilities are needed in order for management to be better and better in order to improve the quality of school work. Schools that are open, where principle quickly and better acquire knowledge and acquire competencies in these areas, will make great progress in enhanced quality among competitive schools in the environment.

Based on our previous experiences, experiences from other countries and on the basis of fundamental scientific and professional research, school principle plays a key role in the entire system of management and management of educational institutions. His role is of critical importance for the organization and functioning of the institution, for the quality of the work of the institution as a whole, for the quality of teaching and the quality of pupil achievement.

Namely, in the first decade of the 21st century, there was a lot of talk about the fact that the school director should be primarily a manager and even the professional development programs of the director were done accordingly. However, since 2010 there has been a change in the approach to the role of school principals.

At the recently held First Regional Conference of the Association of School Principles of South East Europe, held in Sarajevo from 22 to 24 November 2012, in the presentation of the representatives of the European School Heads Association (ESHA), Mr. Chris Harrison, it was pointed out that the research confirmed that 60 % of the impact on pupils' achievements has a school, i.e. 35% teachers and 25% school principal, and all others (society, family, local community, parents ...) 40%.

We are witnessing an increasingly informal evaluation of schools by the community-local community, and above all by the parents. Especially important is the opinion of parents of new pupils, because their attitude will depend on whether a school will enroll a sufficient number of pupils.

It is believed that these attitudes are mostly dependent on the principle and his attitude towards obligations and tasks, or his relation to the established / stated competences. It is therefore essential that when choosing a school principal, the factors influencing that decision are the most responsible.

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Impact of Changes in the Curriculum on Successful Acquiring and Following of the Content in the Course Computer Networks

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ABSTRACT

Every faculty defines certain number of competencies that students who successfully graduate should gain. Every competence is a result of several well-structured and logically connected courses. Two years ago, certain changes were made in the curriculum of the Faculty of Information Technologies, with the goal of focusing on the field of software engineering because of the high demand for software engineers on the market. Previous curriculum had clearly defined line of competencies related to the field of communication technologies and the profession of system and network administrator. Curriculum modifications changed order of courses and sequence of presenting certain topics that are crucial in gaining competencies. This paper shows that the changes in the curriculum resulted in increased number of students with minimum knowledge in the field of computer networks and communication technologies.

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Accessing Students According to Their Locus of Control

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Abstract - Locus of control determines a person's reaction to events in the environment and also who is responsible for these events. A feeling of uncertainty during studying is permanently present in the student population both in the form of uncertain outcome of their work and in shaping their future career. Locus of control also determines how a certain person reacts to uncertainty, whether he/she perceives it as a treat or challenge. This paper aims to distinguish theoretically the importance of accessing students according to their locus of control.
Key words: locus of control, education, accessing students.

I. INTRODUCTION

Changes that students experience during their students' life directly affect their product. It is well known that changes cause indignation, therefore it is of crucial importance for educators to get to know their students so they could prepare them for these changes. Professors should encourage students to accept the changes and positively react to them and also to use their potential maximally in order to realize their own vision and the mission of both their schooling and career.

The work and mission of institutions of higher education is oriented towards achieving better motivation and higher degree of satisfaction of both teaching staff and students. Motivating students for deeper research and permanent learning whose final result is knowledge represents the aim of the teaching process and its realization.

II. LOCUS OF CONTROL DEFINITION

The concept of locus of control in psychology was first introduced and defined by Julian Rotter in 1966. A control position defines what someone thinks about who is responsible for events in his/her life. For this reason it is significant to define students' control position. According to Rotter's theory, locus of control is divided into "internal locus of control" and "external locus of control". Internal control is a term used to describe beliefs that we can affect and control our future and future outcomes while external control is related to expectations conrolled beyond us, so our future is "in the hands" of other people or it depends on fate, chances, etc. [3].

Rotter's concept of locus of control is viewed as one-dimensional (internal to external). Later, a new model which views locus of control as multi-demensional phenomenon was made. This new model is consisted of three factors that people believe to be influential on events in their lives and they are: a person himself/herself, powerful others and chances. In the first case, we do not need anyone in order to have control of the future outcomes, in the second one, we achieve control via other people and, finally in the third case, it is not possible to gain control because the world is viewed as an unpredictable place without any order.

According to multi-dimensional locus of control model, it is obvious that each of these dimensions of control functions independently but simultaneously. For instance, a person can believe that both he/she and external factors are responsible, at the same time, for the same outcome. Those with high internal locus of control have better control over their behaviour and they show more orientation, so it is more probable that they will try to influence other people than the ones with high external locus of control. They also assume that their efforts are crucial for their success. Moreover, they are active in searching for information and knowledge related to their situation.

In his research, Rotter noticed that rewards and punishments related to a certain type of behaviour of an individual strenghten expectations according to which the same behaviour will cause similar reactions (positive or negative) in the future as well. Besides, the level of expectations related to the repetition of similar consequences was higher in the group of people who believed that the

consequences depended on their own behaviour and actions, in other words, on themselves. Rotter concluded that beliefs were in fact events which occured as consequences of internal or external activities and which made one of personality characteristics. On the grounds of these beliefs the concept of locus of control was developed. It represents a personal attitude or belief regarding the extent of the possible influence on important events in one's life. Furthermore, the persons characterized by internal locus of control believe that these events are also direct consequences of their earlier activities and deeds unlike those with external locus of control who see their important life events as an outcome of pure coincidences or chances.

Psychologists differentiate mutually connected concepts, such as locus of control, self-efficacy, self-respect, neuroticism or experienced behavioural controls. Judge and his collaborators (1997) concluded that locus of control, self-efficacy and neuroticism were indicators of equal concept of higher order [4]. Furthermore, thy suggested that these three constructs plus self-respect, represented the basis of self-estimation, such as personal values.

According to Cobb-Clark who cited Ajzen, locus of control and self-efficacy are the part of a wider context of experienced behavioural control [5]. Thereby, locus of control reflects a person's attitude towards personal events, whether these events are determined by personal actions and conduct, whereas self-efficacy represents a measure of an individual to accept certain behaviour. For this reason self-efficacy is dependent on the context, in other words, it is related to the experienced weight of a certain action or behaviour and locus of control is a general heading which does not change in different situations.

III. CAUSATIVE AGENTS OF LOCUS OF CONTROL FORMATION

On the grounds of previous researches it can be concluded that development of locus of control stems from family, culture and/or experiences that lead towards rewarding. Internal locus of control in most cases comes from the inside of the family which was focused on efforts, education and responsibility. On the other hand, the highest external locus of control stems from the families with low social – economic status, lacking in life control. Causative agents of locus of control are

still being researched. There are two viewes – first, that locus of control is inbuilt or stable and second, that it is unstable, changeable and therefore can be learned. Although being stable, locus of control can have some variations but not drastic ones, which means that these variations can develop only inside a certain type of locus, therefore they can affect intensity but not a direction. On the other hand, variations related to unstable or changeable type of locus can go from internal to external locus vice versa, which means that they go beyond the intensity range and change a direction. There is therefore a dilemma if locus of control is inbuilt and enables only smaller oscilations within intensity. Social-demographic characteristics are crucial in both cases whether in building locus or in affecting the intensity.

IV. LOCUS OF CONTROLE - LITERATURE REVIEW

According to Jaffe some persons believe that they have no personal control over circumstances. These persons are functioning from an external locus of control and perception of their own aggression [10]. Rotter describes "locus of control" as "... the degree to which individuals believe the things that happen to them are due to internal versus external factors" [11]. If individuals believe that they have no control over the circumstances of their lives (external locus of control), they will act according to such beliefs. Thus, and vice versa, when persons believe they are in control over life or circumstances (internal locus of control), such persons' behaviour and actions will reflect this stance [12].

Aggressive behaviour forms part of the everyday life of individuals in society. People of all ages, cultures, and both genders express their frustrations and emotions in variable aggressive ways. Lintner shows that there is a direct relationship between frustration and aggressive behaviour [13]. According to Cooper, there is increasing concern about the increase in the destructive nature of aggressive behaviour, specifically within the school context since it interferes with the education process [14]. Adolescents lacking in social skills develop irritation that could lead to aggressive behaviour. They often experience failure in school because they frequently fail to do their homework and thus experience difficulties at school [15].

According to Breet, L. et. al the significance of the relationship between the perceptions of own locus of control and the perception of aggression of adolescent boys was investigated. The coherence between boys' perceptions of their own locus of control and aggression was examined by making use of the correlation calculations. Significant coherence (correlation) was identified on the 0.01 level between locus of control and the various manifestations of aggression. Locus of control correlated significantly with physical (0.279), verbal (0.200), indirect (0.175) and aggression in total (all items included (0.197)) for all the adolescent boys [9]. Thus a significant relationship between locus of control and all the manifestations of aggression was identified. The finding that there is a direct relationship between locus of control and aggression, and physical, verbal and indirect aggression, is in agreement with the findings of Österman [15].

The analysis concerning the relationship between perceptions of own locus of control and aggression was followed by an investigation of the differential analysis regarding the significance of differences. On the multivariate level there was a significant difference between boys with an external and internal locus of control on the 0.01 level (p = 0.006. A univariate analysis followed this identified multivariate significance difference. It was found that boys perceiving themselves as having an external locus of control, in comparison to boys perceiving themselves as having an internal locus of control, had a significantly higher physical (1%), verbal (1%), and indirect (1%) level of aggression. The averages of boys perceiving themselves as having an external locus of control, in comparison to boys perceiving themselves as having an internal locus of control, was significantly and substantially higher, i.e. for physical (1.57 < 1.92), verbal (2.22 < 2.58) and indirect aggression (1.60 < 1.85).

According to Silvester, J. to in one study, 139 undergraduate students and 37 personnel managers to rate internal‑controllable, internal‑uncontrollable and externaluncontrollable candidate attributions for hypothetical past events according to the likelihood of each producing a positive impression during a selection interview. Students also completed Rotter's Locus of Control questionnaire and the Interview Behaviour Scales. Students and personnel managers rated internal‑controllable attributions most likely to create a positive impression. However, students with an external LoC rated external‑uncontrollable explanations and internal‑controllable explanations as being equally likely to convey a positive impression. In Study 2 a group of 62 candidates applying for actual positions with a company completed the same attribution questionnaire prior to first‑stage interviews. Interviewer ratings of candidate performance correlated positively with ratings of internal‑controllable explanations (r =.36, p< .001). In Study 3, a sample of 103 experienced interviewers completed the attribution questionnaire and the WLOC. All interviewers rated internal‑controllable attributions most likely to convey a positive impression of a candidate. However, locus of control mediated preference for candidate attributions such that 'External' interviewers rated external‑uncontrollable attributions significantly more likely to convey a positive impression than 'Internal' interviewers [6].

According to Wang, A. Y., & Newlin, M. H. in study compared the cognitive-motivational and demographic characteristics of students enrolled in 3 Web-based sections of Psychological Statistics with their counterparts in 3 conventional (face-to-face) sections of this course. However, demographic differences were found, however, cyberstudents exhibited a greater external locus of control than conventional students. The authors also investigated whether there were any predictors of student performance in Web courses. Measures of on-line course activity (e.g., homepage hit rate), and high need for cognition, and an internal locus of control were predictive of cyberstudent success [7].

According to Skinner, E. A., et al. a new conceptualization of perceived control was used to test a process model describing the contribution of these perceptions to school achievement for students in elementary school (N = 220). Three sets of beliefs were distinguished: (a) expectations about whether one can influence success and failure in school (control beliefs); (b) expectations about the strategies that are effective in producing academic outcomes; and (c) expectations about one's own capacities to execute these strategies. Correlational and path analyses were consistent with a process model which predicted that children's perceived control (self-report) influences academic performance (grades and achievement test scores) by promoting or undermining active engagement in learning activities (as reported by teachers) and that

teachers positively influence children's perceived control by provision of contingency and involvement (as reported by students). These results have implications for theories of perceived control and also suggest one pathway by which teachers can enhance children's motivation in school [8].

V. IMPORTANCE OF MOTIVATING STUDENTS TOWARDS LOCUS OF CONTROL

Motivation can be defined as a process of starting some activities with the aim of realization of certain aims, directing these activities towards determined objects and also selecting and regulating methods for achieving these goals. On the other hand, motifs are internal factors which represent impetus, a driving force that directs and manage activities. Motifs are organic and psychological factors which activate or direct a person's behaviour, both his/her activities and observation, learning and thinking [1].

In order to approach students in the right way it is necessary to get to know their personality and have knowledge about how influential different motivators on different personality types can be. Psycho – moral characteristics of students as well as their social – demographic ones direct their behaviour to education and other people, too. Harmonization, direction and motivation of students' work represents a real challenge in pedagogical approach. Knowing these characteristics can have decisive role for this approach. For all these reasons it is necessary to create a uniform approach to all students and develop a sustainable strategy. By envisaging students' psychological side it is possible to predict future steps and general approach to tasks.

Motivating students in relation to their locus of control is in fact motivation from psychological side. The analysis of students' locus of control represents their psychological analysis. Locus of control is taken as a starting point for personality analysis but it serves also to improve results, both personal and collective. Position of control is a term in psychology which is related to personal opinion on the causes of the achieved results in life. In other words, position of control speaks about how an individual sees who and what affects or causes good or bad results or events in his/her life.

Julian Rotter developed a motivation theory which predominantly includes cognitive variables.

Rotter (1954) describe locus of control as a hypothetical construct which refers to the degree to which an individual believes that the appearance of reinforcement is cognitively linked to his/her behaviour. Generally speaking, locus of control can be viewed as the behaviour in the function of expectation and reinforcement in certain situations. Rotter (1954) noticed the following phenomena while he was studying individuals:

1. Different people put in the same conditions learn different staff;
2. Some people give predictable answers, the others answer less predictably while some give totally unpredictable answers;
3. Some people observe strong and direct relation between their behaviour and rewards they receive [2].

On the grounds of people's reactions to some events certain categories of reactions were established. It is significant to determine factors on which conclusions and attitudes on some issues are made. However, based on the knowledge on different profiles of people it is possible to classify certain groups of personalities and form an appropriate approach beneficial for students' education and career orientation.

VI. CONCLUSION

Professor – students approach according to studens' locus of control can result in their successful collaboration. It can motivate students to develop their self-efficacy. In this respect, the aims of the institutions for higher education should be created in such a way to motivate students to study efficiently and effectively.

The significance of knowing and understanding different personalities and adequate management of their activities are not beneficial only for the improvement of organizational functioning but they are important for the orientation of a society as a whole

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Education in the Logistics Sector in AP Vojvodina

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Summary - Permanent changes and constant challenges in modern business environments impose the processes of implementing the idea of globalization. End customers appear with increasingly complex requirements and their loyalty is getting smaller. Global tendencies to reduce the life span of all products, the increasing dependence of businesses on business partners, and other important factors affect the overall performance of each company's business, regardless of size, structure and ownership. Without managing logistics and supply chains, these changes and challenges posed by modern companies cannot be effectively addressed. Without any necessary and adequate human resources in this area, it is not possible to achieve any positive result. That is why this area, in our country (in the Republic of Serbia and in AP Vojvodina), is at the center of attention of the highest levels of management that manage the work of the company. Competences and outcomes in the field of personnel training for logistics and supply chain management are recognized as a key business and strategic requirement as one of the most effective ways to improve the market position of each company as a potential participant in a supply chain. In this way, human potentials in logistics are gaining in importance and are increasingly sought in the domestic business environment.

I. INTRODUCTION

Today it is necessary at the same time to point out the lack of trained logistics managers / supply chain and the need for essential changes in the access of domestic educational institutions to logistics and SCM education. In addition to high school and higher education institutions, training and education of personnel in these areas are also performed by professional associations, offering a variety of education and innovation services in the field of logistics and SCM. Dynamic requirements are set so that the listed educational institutions and professional associations must respond quickly to changes and requirements from the environment and enable them to acquire adequate and contemporary competencies in this field. Designing, selecting, introducing and innovating content and teaching methods in studying certain disciplines is very important.

Of the important issues that can be posed in terms of educating personnel for logistics and supply chain management, attention is drawn to the following three sets of issues:

1. Which competencies are expected from future experts in the field of logistics and supply chain management;
2. How to enable effective and efficient learning in the field of logistics and supply chain management
3. **How to benefit from the application of GBL (Game-Based Learning) learning in this field. [3]**

Logistics Manager and Supply Chain Manager are relatively new professions that are recognized at the global level as very important occupations. In the domestic labor market and especially in AP Vojvodina, education of these personnel is practically negligible.

II. THE EDUCATIONAL SYSTEM OF THE REPUBLIC OF SERBIA

During high school education that can be enrolled by persons who have completed elementary education and upbringing, the candidates for enrollment prove the original certificate of the passed final exam and the original certificate of completion of primary education and upbringing and birth certificate. At this level of education, there are generally two educational profiles available: motor vehicle driver and road transport technician, which mainly encompasses technical schools located on the territory of AP Vojvodina. There is one specialized school in the territory of AP Vojvodina for the training of personnel needed for work in the logistics sector. This secondary school enrolls students on a three-year and four-year education for the following educational profiles, annually:

o about three-year educational profiles:

- Motor vehicle driver - 90 students

  o about four-year educational profiles:

- Road traffic technician - 150 students
- Internal traffic technician - 30 students
- Nautical technician - river direction - 30 students
- Towing technician - 30 students
- Transport technician - 30 students
- Transportation salesman - 30 students
- PTT traffic technician - 30 students

The educational structure of the population in the Republic of Serbia and consequently in the AP Vojvodina is a special challenge. Problems in access to education have not been resolved, student dropout exists from all levels of education, and by most indicators we are at the bottom in Europe. Still about 10% of the population does not complete primary school (or do not enroll or drop out during primary school). Some 90-95% of those who complete elementary school (about 80% of the generation) are enrolled in secondary schools, and about 15% of enrolled students do not complete secondary education (about 35% of the generation). Only 13% completed high school or higher education. The situation is somewhat better if only the active population is looked at, but that level is far lower than the EU average (19% with a tertiary degree versus the EU average of around 30%). Reducing the number of early school leavers and increasing the share of the population with higher education in the total population, which the EU has defined as one of its priorities, is also a challenge for the AP Vojvodina. In school year 2016/17 of regular secondary school there were 58,948 pupils. Nearly 90% of them completed four-year secondary schools - 25.7% grammar school and 63.6% secondary vocational school (for four years). Only three-year secondary vocational schools completed only 10.7% of students. Education profiles for which young people most often decide are: economy, law and administration (15.2%), health and social protection (10.8%), electrical engineering (9.3%), trade, catering and tourism (8.8 %) and mechanical engineering and metalworking (8%), professions from the logistics sector are not even recognized in the general classification of educational profiles.

TABLE I. PRIMARY, SECONDARY, AND HIGHER EDUCATION [2]

TABLE II. BASIC INDICATORS ON SCHOOLS IN THE REPUBLIC OF SERBIA [2]

At the end of the school year 2016/17. In the Republic of Serbia, there were 3,370 regular primary schools, 1,132 primary schools and 2,238 separated departments. The teaching was attended by a total of 543,028 pupils, 483,685 in mains school and 59,343 in separate departments. The first cycle of elementary education (grade 4) ended with a total of 66,662 pupils, of which slightly more boys (50.9%) than girls (49.1%), while the total elementary school (grade 8) was 67.382 students - of which 51.3% are boys and 48.7% are girls.[2]

At the Faculty of Technical Sciences in Novi Sad in 1978, the Traffic Department was established, which later grew into the Department of Transportation. In the Department of Transport,

permanent research is carried out in the field of traffic safety, regulation and traffic management, expertise in the field of traffic accidents, public transport of passengers and goods and research in the field of logistics of the company and postal traffic. Studies at the Traffic Department of the Faculty of Technical Sciences in Novi Sad are divided into three levels. The basic academic studies last for four years with the obligation to acquire 240 ESPBs. Students acquire specialized and multidisciplinary knowledge in order to solve complex problems in the area of assembly, and upon graduation, they become a graduated engineer of traffic. Master academic studies last for one year with the obligation to acquire 60 ECTS. Graduated students of graduate academic studies are competent to solve real problems from practice, and to continue their education and education if they choose to do so. Upon completion of the second degree, the student acquires the title Master Traffic Master. In master studies, students have the opportunity to choose one of the following directions: road transport, rail traffic, water transport, traffic safety, logistics, and design and organization of transport systems. Doctoral academic studies last for 3 years and students receive at least 180 ESPBs, out of which 90 ESPB by passing exams from teaching subjects, 30 ESPB by laying the theoretical basis of doctoral dissertation, and 60 ESPB study research work on realization of doctoral dissertation and designing and defending the doctoral dissertation itself. Students are trained for high-quality and independent scientific research in accordance with the needs of the society. There are four departments at the Department of Transportation: Chair for Road Transport Systems, Chair of Transport and Logistics Systems, Chair of Logistics and Intermodal Transport and Chair for Postal Transport and Communications. The total number of students completing studies at the Department of Transportation at the Faculty of Technical Sciences in Novi Sad is insufficient to the expressed needs of employers in the territory of AP Vojvodina. Unemployment in the Republic of Serbia and AP Vojvodina has a long-term character. Many employees, once they become unemployed, remain in that status for a very long period of time. The international experience shows that the probability of finding a job decreases proportionally to the length of unemployment, which can lead to permanent exclusion from the labor market and increasing the risk of poverty.

TABLE III.   GRADUATE STUDENTS [2]

ДИПЛОМИРАНИ СТУДЕНТИ Република Србија	2014	2015	2016	GRADUATED STUDENTS Republic of Serbia
Укупно				**Total**
Свега	50 501	50 326	51 596	All
Жене	29 575	29 451	30 136	Females
Државни универзитети	30 303	29 752	31 456	State universities
Приватни универзитети	7 636	8 711	7 888	Private universities
Државне високе школе	11 253	10 757	11 341	State schools of tertiary education
Приватне високе школе	1 309	1 106	911	Private schools of tertiary education

The share of long-term unemployed, that is, those who seek a job for a year or longer in total unemployment (15+) is extremely high and amounted to as much as 79.6% in 2005. In the period from 2005 to 2009, this rate was reduced to 66.7%.

III.   THE LABOR MARKET OF SERBIA

As with the overall unemployment rate, it should be noted that a significant part of this reduction is owed to the changed methodology in the coverage of employed or unemployed persons.

The complex situation and unfavorable indicators on the labor market, the lack of harmonization of supply and demand in the labor market, and the lack of harmonization of the qualifications and vocational education system with the EU are the challenges that the AP Vojvodina will face in the upcoming period. The educational challenge is closely linked to the demographic challenge. In conditions where a significant reduction in labor force is expected, it is also expected that this reduced number will achieve an ambitious GDP growth rate of 5.8% on average annually, which in the next decade would lead to the creation of more than 400,000 new jobs. All this imposes the need for the quality of available human capital and its utilization to be significantly improved, and beyond the improvement that will be achieved by a simple change of generations. In the coming period, a relatively larger number of less educated members of older generations will emerge from the working age population, and they will be replaced by a relatively smaller number, better educated. This will formally contribute to the correction of indicators such as the participation of highly educated people in the population aged 25-54 or the participation of inhabitants without qualifications in the working-age population and

the like. This situation imposes on the Republic of Serbia and AP Vojvodina the obligation to build a system of education where lifelong learning will become a reality.[1]

The educational challenge is even greater if one takes into account that the reform of the education system is late in relation to other major sectoral reforms, and that its effects take time. On the other hand, if the strategy of long-term human capital development is not devised, but at the same time it opens up opportunities for productive and creative employment, the Republic of Serbia will face the danger of increasing the number of newly educated experts and skilled workers, primarily to EU countries. Mismatch of supply and demand, or lack of qualified labor force that would meet employers' requirements, i.e. deficit of competences and working skills, the characteristic of the labor force is not only in the Republic of Serbia, but also in most of the EU member states. It is difficult to expect that the existing education system will be able to shift in the short term in line with the changed structure of demand for work, qualifications and skills. Previous EU experience in implementing the Lisbon Employment Strategy by 2010, as well as the new strategic framework for growth and employment in the EU, the Europe 2020 Strategy is necessary in order to coordinate national strategic goals in the area of growth and employment with the European, and define the basic quantitative targets by 2020, whose fulfillment would result in a convergence, a reduced disparity between labor market indicators in the Republic of Serbia (AP Vojvodina) and the EU countries. The next decade will mark a relatively dramatic decline in the working-age population of almost 8%, as a result of the disproportionate ratio between the number of people leaving the labor market and the number of people arriving at the labor market, in case there is no departure of the country's young workforce. This demographic decline will lead to the formal improvement of relative indicators of the labor market, but its essential impact on the labor market and the potential for economic growth will be negative. Potential and available human capital will be reduced, and the continuation of the population demographic aging process will exacerbate direct pressure on important social protection systems, in particular the pension and health fund.

The pronounced territorial unevenness in the development of the Republic of Serbia has a multidimensional character and is determined by inherited geographical, economic, social, demographic and cultural factors. Key regional problems are reflected in the marked depopulation, high unemployment and low economic activity, especially in the non-competitiveness of industrial systems that should be the bearers of regional development, as well as the lack of adequate infrastructure necessary for the launch of economic development [1].

Insufficient economic activity and the lack of jobs in certain regions results in the movement of labor to regions with greater employment prospects. The situation in the south is unfavorable to the northern parts of the country, as well as rural ones in relation to urban areas. The demographic structure of cities, due to migration of the population, is changing, so in some cities and municipalities the number of inhabitants has decreased considerably. In 2016, a negative or zero natural increase was recorded in as many as 158 out of 165 cities and municipalities. Positive natural increase was recorded in 4 municipalities of Belgrade (Zemun, Palilula, Surcin, Cukarica), the city of Novi Sad, the city of Novi Pazar and the municipality of Tutin [2].

IV. DUALITY AND CHALLENGES IN THE LABOR MARKET

The small total number of employees is only part of the labor market problems in the Republic of Serbia. The structure and quality of employment represent an equal challenge. Namely, as already emphasized by monitoring the labor market indicators in different demographic and educational categories in the past decade, it can be concluded that the labor market in the Republic of Serbia and the AP Vojvodina has many dual dimensions:

1. formal and informal market,
2. public sector versus private,
3. employment for indefinite or specified time,
4. Young and senior members of the labor force,
5. Women and men on the labor market and
6. educated and less educated members of the workforce, etc.

The employment situation varies considerably depending on these dimensions, in particular whether a person is employed in a formal or informal economy or with an employer who is in private or public property. Likewise, the type of employment contract that determines the rights and obligations of an employee and employer essentially determines both the safety and the

flexibility of the workplace. The position in the labor market depends on whether individuals belong to one of the vulnerable and often marginalized groups in the labor market. The ILO (International Labor Organization) defines occupation as a set of tasks whose duties and duties are characterized by a high level of similarity. While under the business, it implies a set of tasks and duties performed or determined to be performed by a person for a particular employer or through self-employment. When considering activities related to the establishment of occupational standards in the field of logistics and supply chain management, the situation varies from country to country. The development of vocational education and training should lead to an increase in the employability of the workforce and the matching of supply and demand, the harmonization of the education and training system with the needs of the labor market, and a better approach to lifelong learning, especially for vulnerable groups. Modern professional education in the Republic of Serbia should be based on predefined learning outcomes, professional competences whose achievement will be the basic measure of the success of the educational process. Educational programs must be flexible both in terms of content and in terms of how they are implemented or in duration, with the aim of easier attendance and prevention of early school leaving. The starting point for the creation of such modern educational programs will be the system of national qualifications created through the partnership work of all relevant factors influencing or influenced by such a system. In order to improve quality in vocational education and training, it is necessary to approach the introduction of the European Quality Assurance Reference Framework. It represents an instrument that helps to encourage and monitor the continuous improvement of vocational education and training systems, contains common criteria, guidelines and indicators of quality, monitoring through internal and external evaluation mechanisms, the use of measurement tools, and applies to vocational education and training systems and service providers. Existing occupational titles and professional titles have become outdated and outdated, and qualifications have been based on the National Nomenclature of Occupations which, despite significant technological and social changes and the creation of new and the disappearance of a large number of obsolete occupations, has not changed for almost 20 years. A new national occupational classification system

has been developed according to international standards and principles for the development of national occupational classification systems ISCO and ISCED. Development of monitoring tools and forecasts on the labor market, as well as monitoring and evaluation of programs and measures in the field of education and training is one of the priorities. Identifying necessary / missing skills in the labor market is very important in planning education policy and training programs. This represents an important segment of the development and planning of education towards the real needs of the labor market.

V. THE QUALITY OF HUMAN RESOURCES

In the basis of economic growth and the development of an innovative and competitive economy, with more jobs and better jobs, there is investment in human capital and the quality of the education system. Appropriate knowledge and its application were recognized as the basic development factor that the Republic of Serbia and AP Vojvodina, in view of the other available factors and resources, have to fully utilize. The development of the economy and society cannot be imagined without appropriate human resources, so that the development and management of human resources includes all processes and activities aimed at increasing employment and productivity of labor, development and education of personnel, by increasing the qualifications and competencies of the workforce and creating a legal regulations in the field of education and employment. The process of education and learning should be directed towards the outcome of learning, i.e. the applicability of acquired competencies and increasing competitiveness in the labor market. Cooperation between the ministries of education and employment will be reflected in the analysis and planning of the education policy in accordance with the needs of the labor market and the improvement of the quality of education and training, especially in the part relating to short training and practical training that should be harmonized with the formal education system, because practical knowledge and acquired skills are of great importance for employment and inclusion in the world of work.

VI. STRATEGIC RIGHTS AND GOALS FOR THE DEVELOPMENT IN LOGISTICS

On this occasion, special emphasis should be placed on the implementation of short training programs for hard-to-employ and most vulnerable

groups in order to increase their qualifications and competitiveness in the labor market. Strategic directions and goals of the development of the AP Vojvodina have been elaborated precisely through the matrix of strategic directions / priorities, measures and activities in which all the secretariats of the Government of AP Vojvodina and regional development agencies took part on the basis of socio-economic analysis and priorities and measures of the proposal of the National Plan for Regional Development 2014 -2020. Four basic priorities are defined:

1. Development of human resources,
2. Development of infrastructure and conditions for a decent life and work,
3. Sustainable economic growth,
4. Development of institutional infrastructure.

The economic structure of the province economy reflects the conditions and effects of the social and economic trends in the Republic of Serbia. The development scale of the AP Vojvodina has highlighted several factors that contributed to the economic concentration in South Bačka District and in 8 cities:

1. The most important factor is the demographic trends in the AP Vojvodina - the scope, structure and educational capital, which carry with them a decade-long overwhelming workforce from border, underdeveloped and economically depressed municipalities, infrastructurally unconnected and with low performance for raising living standards, directed the intensity and the flow of migration to large cities, that is, regional centers;

2. The relationship between the development of the sector and the region is another aspect that emphasizes the importance of coordination between the undeveloped areas and the whole economy, and

3. Infrastructure requires a certain volume of economic and non-commercial activities in order to be able to be efficiently used. AP Vojvodina, which has a higher level of road network construction and equipment with modern roads, records insufficient equipment for communal infrastructure, which limits the possibilities for the development of companies and logistics as an economy branch.

VII. CONCLUSION

In order to improve the quality of labor supply, developing models of recognition of knowledge and skills acquired through prior learning (through informal forms of education and informal learning) would significantly contribute to the increase in the qualification of the workforce and hence competitiveness in the labor market. The importance of recognizing previous learning and acquired knowledge has been recognized by all relevant ministries and institutions of the Republic of Serbia, but there is still no clear model for recognition of the process of recognition and therefore in the following period this will be one of the priorities in the field of education and employment. The essence of recognizing non-formal and other forms of learning is that learning relevant to qualification, its components, or any other formally established form should be recognized, regardless of the process through which the processes and experiences have acquired knowledge or competencies. Recognition of the results of previous learning is of great importance for the labor market because often knowledge, skills and competences are present in the unemployed, but are not visible because they are not officially recognized. The existence of a national qualifications framework is crucial for developing recognition of the outcomes of informal and other forms of learning. The link between national qualifications frameworks and the recognition of prior learning should be based on the fact that qualifications that are included in the national qualifications framework are generally recognized and accepted. Recognition of prior learning is also crucial for developing a system of education after the level of compulsory education, because it will recognize learning regardless of how, when and where it is acquired, provided it is relevant to learning outcomes or acquiring competence, in an object, unit module, course or qualification. As one of the ways to resolve the issue of recognition of previous learning, it is first of all seen in the formation of bodies at the state level that would, inter alia, be engaged in the certification of knowledge and skills, and recognizing the results of previous learning with relevant institutions.

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Entrepreneurship In Math And Vice Versa

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ABSTRACT

Entrepreneurship in elementary school is a novelty in Serbian educational system. The paper discusses its validity and importance, and presents its basic principles and methodology. Particular examples concerning some abstract mathematical notions are considered.

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The Importance of Lifelong Learning

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Abstract – Given the rapid changes in industry and technology today, individuals must accept the fact that continuous learning is necessary to be able to have an successful and fulfilled personal and private life. The concept, idea and importance of some aspects of lifelong learning are going to be presented in this paper.

I. INTRODUCTION

Today's knowledge-based labor market requires people to continuously and qualitatively improve their knowledge throughout their lives. They must be individuals who are aware that the responsibility for their progress lies only with them, and must invest time and effort in the continuous learning process. In all developed countries, human capital is one of the main forces driving the development of the country. Human capital is usually approximated with the average level of qualification, i.e. education of the population [12]. Education is defined as freedom and ability to shape oneself in the process of becoming a man, while changing the circumstances imposed on him historically and culturally [6].

According to [11], a knowledge-based economy is based on the following:

- An economic and institutional regime that will support its development and encourage efficient use of existing and new knowledge;

- Educated and trained population that is able to create, share and effectively use knowledge;

- Dynamic information infrastructure that will support effective communication, dissemination and information processing;

- An efficient system of companies, research centers, universities and other organizations that will adopt new knowledge and technologies and adapt them to local needs.

Although the goals linked with the concept of lifelong learning are often of economic nature (achieving greater competitiveness and lasting employability), equally important goals are those that contribute to the more active role of the individual in society (encouraging social inclusion, developing active citizenship, developing individual potentials of individuals ...) [3].

II. WHAT IS LIFELONG LEARNING?

Lifelong learning may be broadly defined as learning that is pursued throughout life: learning that is flexible, diverse and available at different times and in different places. Lifelong learning crosses sectors, promoting learnin gbeyond traditional schooling and throughout adult life (ie post-compulsory education)[9]. This definition is based on Delors' (1996) four 'pillars' of education for the future:

- Learning to know - mastering learning tools rather than acquisition of structured knowledge.

- Learning to do – equipping people for the types of work needed now and in the future including innovation and adaptation of learning to future work environments.

- Learning to live together, and with others – peacefully resolving conflict, discovering other people and their cultures, fostering community capability, individual competence and capacity, economic resilience, and social inclusion.

- Learning to be – education contributing to a person's complete development: mind and body, intelligence, sensitivity, aesthetic appreciation and spirituality.

The European Lifelong Learning Initiative defines lifelong learning as "…a continuously supportive process which stimulates and empowers individuals to acquire all the knowledge, values, skills and understanding they will require throughout their lifetimes and to apply them with confidence, creativity and enjoyment, in all roles, circumstances, and environments" [7].

Lifelong learners have been characterized as curious, flexible, motivated, and reflective [1].

What is obvious is that the context of lifelong learning has changed and that it is utopian and the noble vision that has so far characterized lifelong learning has now become an inevitable guide and organizational principle of educational reforms.

Today it is an irreplaceable tool that enables education to face many of its current and emerging challenges[8].

Lifelong learning extends through different levels and types of learning. Through general education to professional development, from the needs of young people to the needs of the elderly, as well as the needs of the employed and the unemployed. Lifelong learning implies different levels of learning (formal, informal, informal) and researching the literature of various authors, it can be said that it includes: trainings and professional development, integration of IT and communication technologies, acquisition of information literacy, foreign language learning, mobility in learning, etc.

While there is a wide range of reasons to engage in lifelong learning, there are also many types. These fall along a spectrum of informal to formal learning opportunities [2]:

- Formal. Formal lifelong learning often takes place as part of a scheduled and monitored sequence of learning such as college courses. This type of learning is not done on demand and usually follows a set schedule with a cohort of learners.

- Self-directed. When students have control over the path and pace of learning it may be known as self-directed. Examples of this in lifelong learning may include online courses that can be taken on demand when your schedule permits, like MOOCs. This may also include YouTube workshops that are sequenced but self-paced.

- Professional. One of the most common types of lifelong learning happens at work through professional development, job training or skill acquisition, and it is usually tied to career passion. Learning on the job, both formally and informally, is a primary way of lifelong learning. Some companies like Google and Microsoft allow employees to spend up to 20% of their week on projects and interests that are not directly related to their current role. This type of learning ties together professional and personal lifelong learning.

- Personal. This type of lifelong learning is usually done outside of the workplace, and is often tied to a passion or interest. Individuals may pursue this learning informally or formally.

- Indirectly. Some lifelong learning happens without you even planning or knowing about it. Through conversations, unexpected lessons learned, relationships or travel, the world around you may expose you to new ideas and learning than you had even planned for.

- Informal. At the opposite end of the spectrum from formal learning is informal learning. Individuals may choose to learn through reading, watching YouTube, from a peer, or by trial and error. The ways to learn informally today are endless.

III.   ADULT EDUCATION AS A PART OF LIFELONG LEARNING

The creation of a global economic market has imposed the need for countries to increase overall national performance. In raising the level of educational attainment and performance of the population, special attention is paid to those with the lowest achievements and lowest levels of qualification, as these are the groups whose advancement is most important for the increase of average performances at the national level of one country. The strategies that are developed for these groups of people have a special significance for two groups outside the traditional education system (formal education): young people who do not have secondary education and unskilled adults.

The pressure to develop these strategies is very strong nowadays and is intensifying while countries are struggling in the global economic market with "human capital", that is, the quality of their population in terms of education as the main asset. Political reasons on the one hand propagate equality and the rights to education for all the people of a country, while economically, on the other hand, require an increase in performance through the improvement of the skills of the existing workforce.

Through this, professional development becomes a very important part of adult education. Improving the level of expertise and skills of the adult population and creating a better learning opportunity is important from the aspect of increasing efficiency and equity, in order to create better workers, more informed and active citizens, and more satisfied people. Challenges that most countries face today - enabling economic growth, competitiveness and social inclusion - among others depend on education and expertise as critical factors. However, adult education still lacks the attention it deserves in terms of its prevalence, priorities and resources. According to [10], adult education includes all the ways of learning for those who have left formal education at any stage; learning for personal, civic and social purposes, as

well as for the purpose of employment. It can take place within formal education or in other environments.

Adult education is rapidly developing today with the aim to:

- Provide a second chance for schooling for those who have left school early and do not possess any qualifications;

- Raise the level of expertise of the workforce, especially those with the lowest qualifications;

- Reduce poverty and social exclusion of marginalized groups;

- Increase participation in lifelong learning. It is necessary to create an efficient and high quality adult education sector in order to achieve the aforementioned goals. In doing so, attention should be paid to the following:

- Improve the preparation and efficiency of the staff to train students;

- Enable attainment of a qualification that is at least one level higher than the existing one;

- Analyze the effects of reforms implemented in education on adult education;

- Recognize non-formal education when it comes to marginalized groups;

- Improve the monitoring and control of this education.

IV.   WHY IS LIFELONG LEARNING IMPORTANT?

Regardless of which reason is the most compelling for an individual to engage in learning, some of them can be summed up as following [getting smart]:

- Skill Up (Functionality). At home and at work, in order to function effectively day-to-day amidst a rapidly changing world, we need to learn new things.. Whether it be learning to use a new phone, a new app, or a new process at work, building skills is a constant in an ever-changing world.

- Purpose and Path. One term that has been used over the past couple decades when addressing purpose and path is "college and career readiness." This is where a concept of "life readiness" emerges which refers to the development of perseverance, a growth mindset (at its core, a belief that we can all

continue to learn and grow throughout our lives) and other social-emotional skills.

- Passions and Life Satisfaction. Pursuing passions and interests outside of work (where you might have already done a lot of learning, or feel saturated) is important.

- Employability. Today, the average person changes jobs ten to fifteen times during their career. Some cite even higher numbers. Both learners and learning providers are adapting accordingly.

- Economic Imperative. Closely related to employability, learning is becoming an economic imperative. Technological change demands stronger and more continuous connections between education and employment.

- Leadership. Tesla CEO Elon Musk, who has mastered industries as diverse as software, energy, transportation and aerospace, shares 3 "secrets" that power his leadership:

- Become an 'expert-generalist'

- Improve your 'learning transfer' skills, and

- View knowledge as a 'semantic tree.'

- Social Awareness and Perspective. In order to truly empathize with others, increase social awareness and build relationships, we must intentionally seek out ideas that differ from our own. This is critical not only to the health of individual relationships, but also the health of society.

- Practicality. We live in an era where you can fix pretty much anything in your home by watching a YouTube video. This anytime, anywhere learning has created a DIY (do it yourself) culture that allows people interested in everything from home improvements to crafting to cooking to learn practical skills that they may have otherwise hired out for.

- Longevity. We've all heard the stories of people who have actively learned their entire lives living longer. Health research has pointed to lifelong learning as one of the best ways for seniors to stay healthy. An active mind throughout your life has been proven to help you live longer and healthier.

V. CONCLUSION

Knowledge is the primary source of value in our world today. One's ability to expand mind and strive for lifelong learning is critical for success. By dedicating to learning, one can get ahead in every aspect of life. All it takes is a commitment because lifelong learning requires self-motivation and the need to feel positive about learning and about ability to learn. Transferring knowledge anywhere in the world is free and instant. Its value compounds over time faster than money. It can be converted into many things, including things that money can't buy, such as authentic relationships and high levels of subjective well-being.

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Mentorship in the Process of Introducing the Teacher Prentice in The Primary and Secondary Schools

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ABSTRACT

This paper highlights and explains the importance of mentoring in the process of introducing prentice teachers to work in primary and secondary schools, starting with emphasis on traineeship, and then highlighting the importance for students, the mentors themselves and the entire educational institution. The legal regulation of the process of introduction into the work of teacher prentices in the Republic of Serbia has been described and explained. The competences, the knowledge, skills and abilities necessary for achieving educational work, which the program of introducing into the work of a trainee teacher should acquire, were also described.

According to the decision of the Scientific Committee of the ITRO Conference, the entire paper is scheduled for publication in the Journal ITRO Vol.7.

A* Search Algorithm and Comparison of Heuristics

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Abstract - The paper investigates A* (A star) algorithm and its application on a path finding problem. The algorithm is described and then application is presented. This application is useful for education because of experimental capabilities and graphical representation. In addition, some heuristic functions are given and compared based on optimality and time consumption.

I. INTRODUCTION

State space search process is basic concept for many techniques in the domain of Artificial Intelligence (AI). It is very important to clearly describe the search process and the algorithm used. This is important for the domain of education because students must acquire knowledge about the algorithm and its use.

There are two basic state space search concepts: blind search (uninformed search) and informed search depending on a knowledge about a problem represented by a graph. Informed search uses heuristic information as a directed search method. It consists of special rules and other knowledge, the so-called heuristics which are useful for reduction of state-space graph and speeding up the search process.

The heuristics for the search of the state space are focused on the choice of the perspective operator and the choice of the perspective graph node. In the first case, a set of operators is arranged by associating each operator with its price. The price is usually expressed in real numbers and is associated to graph-arc which represents given operator. Heuristics for the selection of a perspective node generally mean the arrangement of a set of nodes in terms of the order of their opening. For this, different perspectives can be used, via so-called heuristic cost functions [1, 2, 3].

A. Cost functions

The purpose of cost function *f* is to rank nodes and to determine the order of their opening. The value of function *f* for node *n* *f(n)* represents an estimate of how long the search will take time starting from node *n*. The choice of function *f* can be very difficult, and the search efficiency depends on that choice. The selected cost function dictates whether the heuristic strategy, determined by this function, will continue the search process from the node with the highest or with the lowest value of cost function. There are many types of cost functions and search strategies, but in this research algorithm A* (A star) is evaluated.

II. A* ALGORITHM AND HEURISTIC FUNCTIONS

The main purpose of this work is to create a simulator that can explain path finding problem to new students, so that they can understand easily how algorithms work.

A. History

A* algorithm was developed in 1968 by Peter Hart, Nils Nilsson and Bertram Raphael of Stanford Research Institute. It presents an upgraded version of Dijkstra algorithm from 1959 and its primary purpose was usage in project "Shakey", which was the first mobile robot that had an ability to interact with its surroundings. In 1970, Life magazine referred to Shakey as the "first electronic person".

B. Algorithm

The main step in A* algorithm is evaluation of distance function and choosing next step on grounds which direction will produce the shortest path. The function whose minimum we are searching for is:

$$f(n) = g(n) + h(n) \qquad (1)$$

where $g(n)$ presents real distance from start node to node *n* (these are resources spent to reach node *n*) and $h(n)$ presents an estimate of distance (resources) from node *n* to finish node. Total distance *f(n)* will be minimal if $g(n)$ and $h(n)$ are minimal, so in every step, the algorithm chooses next "hop" on those premises [4, 5, 6, 7].

C. Map

Map that will be used is a grid map with dimensions 20×20, and it allows movement in all eight directions. The cost of movement is calculated as a real cost. That means that movement from square A1 to B1 costs one movement unit and movement from A1 to B2 costs $\sqrt{2}$ movement units as shown in Fig.1. This also allows for a path to go through two adjacent blocks of wall if there is a free diagonal square available.
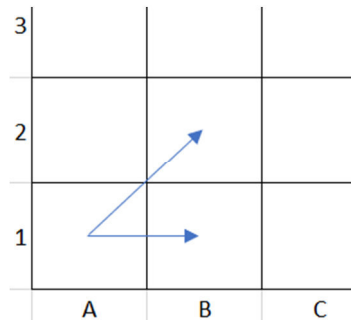

Figure 1. Map with distances

D. Different heuristics

A* algorithm can give optimal results only if heuristic function used, h(n), is not over pessimistic, meaning it can make prognosis that the node is nearer to the finish node, but not vice versa. To show this, we will use different heuristic functions:

- The most ideal heuristic function is the one that is closest to the real distance, and for our map that is Euclidean distance:

$$h(n)_{Euclidean} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}. \quad (2)$$

- Second heuristic function that we will be testing is Manhattan. This heuristic function is a bit over pessimistic, and its results will not always be ideal:

$$h(n)_{Manhattan} = |x_2 - x_1| + |y_2 - y_1| \quad (3)$$

- Next heuristic function is using Chebyshev distance. It is a bit more optimistic than Euclidean:

$$h(n)_{Chebyshev} = \max(|x_2 - x_1|, |y_2 - y_1|) \quad (4)$$

- For better demonstration, we will add four more heuristic function. Two are derived from (2) a (3) and two are constants:
  - o Half Euclidean with value of ½ of (2)
  - o Five Manhattan with value of 5 times (3)
  - o Zero with value of 0 for all nodes
  - o Two with value of 2 for all nodes

In conclusion, we will use one ideal (Euclidean), three more optimistic (Chebyshev, Half Euclidean and Zero) and three more pessimistic (Manhattan, Five Manhattan and Two) heuristic functions.

III. ASTAR SIMULATOR

AStar simulator was written in C#, using Microsoft Visual Studio 2017. The main window is created from Microsoft Windows Forms App template using .NET Framework version 4.6.1. There are four major parts of working screen, menu, status line, map panel and control panel as shown in Fig. 2. The main objective of the simulator is to calculate the shortest path around walls from start to finish node.

A. Menu

Menu strip incorporates standard Exit feature that closes the program and Save/Load wall feature that enables user to save and load wall configuration to repeat tests with same wall configuration. There is also a Do all tests menu that starts multiple tests with all seven heuristic functions. After all test are concluded, comparable results are shown in a dialog box as shown in Fig.5.

B. Status line

Status strip is used to inform the user about the current step the algorithm is in, and path length, once it is done.

C. Map

Map plane is the main part of the window where user can place one start and one finish nodes as well as multiple wall nodes. The numbers shown in each node represents value of h(n) function in that specific node and is dependent of selected heuristic function. When heuristic function is changed, simulator recalculates h(n) and repaints the map area.

D. Control panel

Control panel is always on the right side of the simulator and contains 4 elements:

1. Timer start/stop button that is used for starting and stopping of A* algorithm.
2. Group box that lets user choose what will be placed on the map plane with the mouse.

3. Group box that lets user choose which heuristic function will be used.
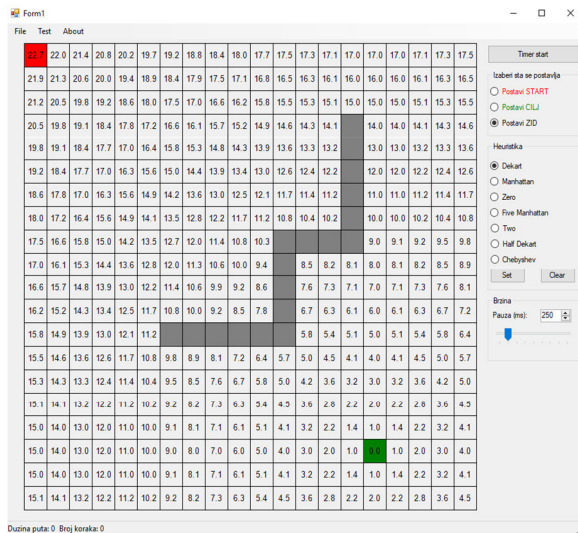4. Speed setting that allows algorithm to run slower or faster.

Figure 2. Simulator main window

IV. RUNNING TESTS

AStar simulator can be used in two ways. The first one is interactive usage and the second one is batch processing where all heuristic functions are tested on the same input parameters to compare which one is the best.

A. Interactive usage

For this type of usage, user first chooses heuristic function, then sets start and finish nodes and finally places multiple wall nodes as obstacles. When done, user starts simulator by pressing Timer start button. While the calculations are in progress, all functions except Timer Stop and Speed group, are inaccessible. If there a need to stop the algorithm, user can press Timer stop button and later by pressing the same button, simulator can be restarted from the same point. Also, user can change the speed while the program is running, as shown in Fig. 3.

Nodes with orange color are visited nodes (ones in closed list), and those with yellow color are potential neighbors (ones in opened list). When the algorithm is completed, and simulator reaches the solution for the shortest path, control buttons will be reenabled and that path will be drawn, as shown in Fig. 4. Also, in status line the user can see path length and number of steps it took to complete the search.

B. Batch processing

Batch processing can be started by clicking on Do all tests menu item. This sets automatically heuristic function on the first, Euclidian, and then runs seven times consecutively, each time changing heuristic function and saving results for comparison. When it is done user can see results in a dialog box as shown in Fig. 5.
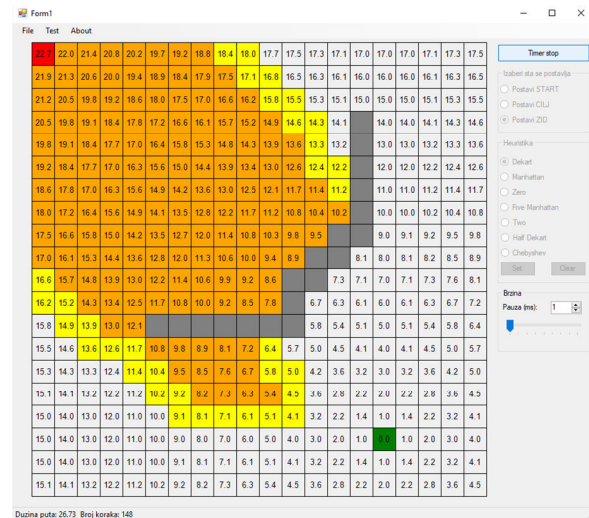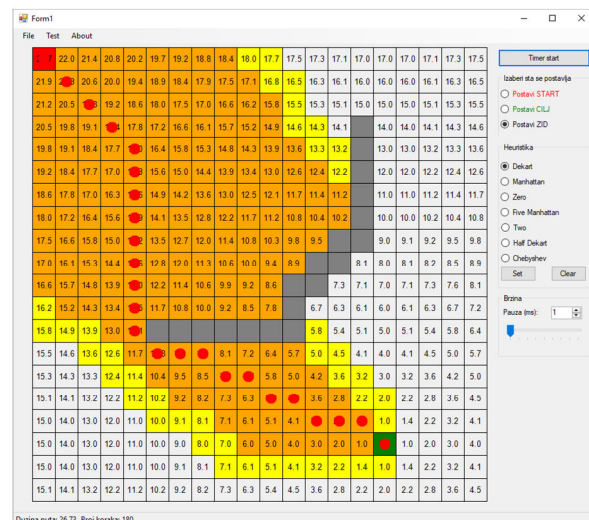

Figure 3. AStar running

Figure 4. AStar finished with best path

Figure 5. Batch results

V. ANALIZING RESULTS

Depending of the wall configuration, we can get different results when using different heuristic functions. We will analyze some situations.

A. Dekart/Euclidian

This is ideal heuristic, and in almost all situations will yield the shortest path. Depending whether the obstacles are simple or complex, this heuristic function can take more time than other. In example shown in Fig. 5, it took 2.18 times more iterations than Manhattan and 3.21 times more than Five Manhattan, while reaching result that was 12.4% less optimal.

B. Manhattan

This simple heuristic function was found to be more than sufficient in many scenarios. The results can be less optimal then the results using Euclidian, but speed was almost always faster. When the wall configuration is complex, this heuristic function gave the same results but in 48% less time, as shown in Fig. 6.
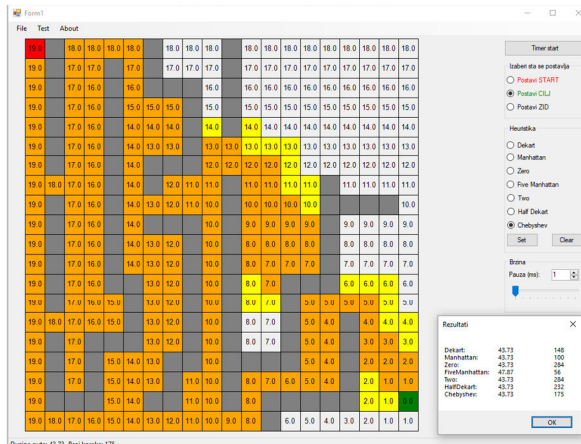

Figure 6. Complex wall scenario

C. Five Manhattan

This was the fastest heuristic function that we used. In complex scenarios it gave close results but for a fraction of time. If you look at Fig.6 you can see that the error was 9.5% and it took 2.64 times less iteration. If there are big holes in walls, like in Fig.3 and Fig. 4, Five Manhattan will always fail with not so optimal path, as shown in Fig. 7, but even then, we did not see errors of more than 13% with still the same speed results.
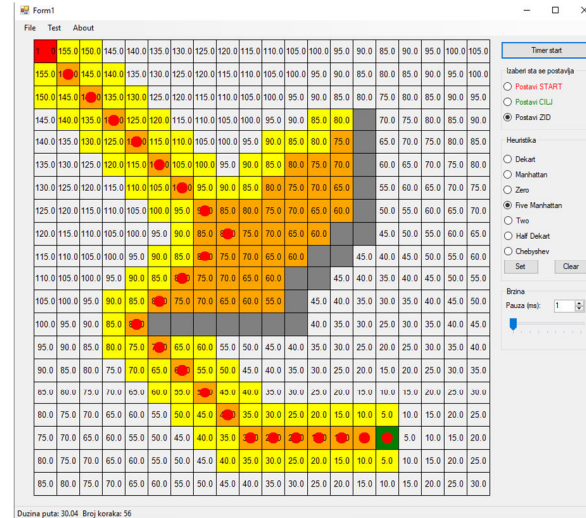

Figure 7. Five Manhattan

D. Zero, Two, Half Euclidian and Chebyshev

These heuristic functions have proven that they would always give optimal results, but the time was also always much greater. So, they are valid only in scenarios where path length is of utmost importance. Out of there three, only Half Euclidian has shown that it has some practical usage, since it gave better results in some specific cases and it was not that much slower. Zero and Two heuristics have shown that they almost always covered too much ground, and Chebyshev was in the middle, not gaining any advantages, not in speed nor in precision.

The only future these functions could have is if we could lower iteration costs, or if we could make each test use learnt data from the previous one.

VI. CONCLUSION AND FUTURE DEVELOPMENT

The A* simulator is very useful as a demo tool to present A* and its application to path finding problem. In addition to demo application, different heuristic functions were applied and compared by means of optimality and time consumption. It is shown that Manhattan heuristic is the fastest one,

while Zero, Two, Half Euclidian and Chebyshev are optimal. However, Dekart/Euclidian is ideal in most situations.

This version of simulator can only test already made wall combination. One way of improving it could be to make program able to test automatically multiple wall configuration with multiple heuristic functions. This feature can be beneficial in scenarios where an artificial intelligence algorithm would first make predictions on what is the best approach on solving the given task, make note on results and then apply this knowledge on future projects. To be able to do this, simulator would first need to gather knowledge by making many tests in advanced and get some common measures of the area (number of wall cells, distribution, center of mass, dispersion etc.). When properly trained, the program could use this new data to first chose the best way for solving the path problem. This way we could get reasonably good data in much less time.

Another feature that is possibly needed is the ability to show details of each step of A* algorithm with opened and closed lists, so students can analyze it and learn from it.

The executable version of AStar simulator can be downloaded from the following location:

https://goo.gl/hH56Te

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Professional Development of Teachers

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ABSTRACT

Despite the enormous development of science and technology teachers remains the main factor in the implementation of education quality. No matter how much a change in education is grounded and theoretically developed, it can't even handle the practice without teachers who understand the changes, accept them and they are trained to apply them. Therefore, following pages are intended to show importance of pedagogical public to the importance of professional development of teachers for achieving quality results in education. Professional development of teachers is long-term process where, during learning, practical work and research activities complement the knowledge and develop skills and abilities. Professional development of teachers is open, dynamic and durable process that implies the transferring of new knowledge from various professional areas and scientific disciplines in the world of practice, as well as tracking European trends as regards of improving the quality of education.

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Creating Video Games Website „Games Squere" Using Modern Technologies

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Abstract – Video games represents gaming creativity of people, respectively sort of interaction and fun with help of analog and digital portable devices. Big influences of video games brings to creation of website for representation information and buying new games on Internet. Using newer technologies for creating websites allows faster and easier user access to information on websites. Website together with today most popular technologies for creating under various convenctions provides fast, easy and realiable way for offering needed information about video games to users.

I. INTRODUCTION

Website offers posability for representing interactive content to todays most popular titles of video games. It is bigger popularity of these web sites on Internet and there is much more users of same websites. Video games has always been source of fun and pleasure. Today video games have become more conterporery and have realistic contents, which develops more and more.

Creation of video games website using newer technologies create progress and represents modern way for placement interactive contents to users. The idea of creating video games website is a desire to get more and more information about gaming industries on one place. Users have direct access to newest contents and they are always involved in the work of gaming industries. Website contents must be always accessible to users in an easy and quick way.

II. USING TECHNOLOGIES

A. HTML5 and CSS3

HTML5 represents natural evolution of an earlier version of HTML (HyperText Markup Language) and aspire to reflect needs of todays and future websites. [1]

Every modern tecnologie brings new features. Using tags, respectively elements of HTML language there are creation of websites pages.

Most of elements are advanced like addition elements (article, section, figure, and more others) which are used to describe contents of website.[1] Using of HTML5 technologie contributes to easier and better development of websites with existing and new technologies. New features in HTML5 technologies are:

- New semantic elements
- Forms 2.0
- Web storage (Improved system of cookies, bigger storage, local SQL database)
- Canvas (Vector drawing)
- Error handling

Figure 1. HTML5 logo

CSS3 represents natural evolution of an earlier version of CSS, which contains newer features. Big amount of different visual effects, like drop shadows, text shadows, rounded edges and gradiants, media queries, multi – columns layout, web – fonts, and more. Big features (pieces) in CSS3 are not yet implemented in the browser.[2] Some stuffs still can not be covered with CSS3 technologies.

Good news is that CSS3 actually represents series of modules, which are designed that can be implemented separete and independent one of another.[2]

B. JavaScript and Jquery

JavaScript represents script language whose purpose is to present interactive contents on

website. It is involved in web pages to make the pages more dynamic. Documents can contain scripts written in JavaScript language, and these scripts can use DOM (Document object model) to modify a document or manage web browser that displays this document.[3] Some of the used JavaScript frameworks for implementing in web pages are: Jquery, Angular, Express.js, Vue.js, React.js, Node.js and many others, which enable easy and quick work with JavaScript.

Jquery as the main library of JavaScript has found in web technologies. Library achieves main purpose of the abstraction layer of web scripting, and almost always used in every scripting situation.[4] The main features of Jquery scriptings are:

- Accessing elements in document using DOM
- Modifying appearance of the website
- Content change of web site
- Respond to user interaction
- Animating changes made in document
- Feedback from the server without updating web pages
- Simplify common JavaScript tasks.

Figure 2. Used of modern technologies in creation of website

C. Canvas animation

HTML5 canvas represents immediate mode in bitmaped area of the screen, which can be manipulated by JavaScript.[5] Direct mode presents how canvas in its basis render pixels on screen. This approach allows HTML5 canvas to be different from Flash, Silverlight or SVG, which are executed in passive mode.[6] The basic HTML5 canvas API includes 2D contents, which allows the programmer to draw different shapes, display texts and displaying images direct at a particular position in the browser window.

D. SASS and responsive technologies

SASS (Syntactically Awesome Stylesheet) represents language for writing CSS styles, which eases the development process. Sass allows implementing variables and functions in CSS

styles, that later turn into clean CSS. So that they can be interpreted in the browser. Using of variables and functions, encoding CSS styles is faster and easier to maintain.[7]

Responsive design is one of the great achievements of development in modern technologies. The time that is necessary for web page to load is very important, so that the user can stay on that page and read contents.[8] Optimization is possible by elemination of unecessery things in website.

III. DESIGN OF WEBSITE

Video game website called „Games squere" is designed to provide users with all necessary information and services about latest game titles. The website is made of 8 pages that are designed using the latest technologies for creation. On website there are following pages: „Home", „News", „Frequently Asked Quesitons", „Gametech news", „About us", „Games", „Video" and „Contact". The website provides the ability to optimize content for mobile phones through responsive design. It is very important to manage the speed of functional performance, and therefore optimize the content of websites for different devices.

The "Home" page provides the ability to display the content of images for the latest titles of games through the slider, which servers to attract users. Beside the slider there is also a list of platforms for playing video games.
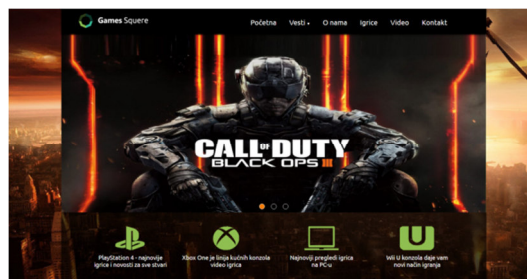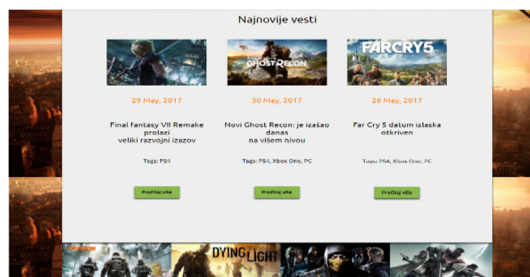

Figure 4.Appearance of Home page

Figure 5. Appearance of News page

The „News" page contains information that is currently associated with the most popular video games titles. The introductory content is set, where the user through the interacts of buttons access other page with full content of the latest news.

Users are able to ask a questions on the site and get answers about particular topic, and this is exactly what is on the FAQ page. The page is designed to display questions and answers in the form of text.

Figure 6.Appearance of FAQ page

The „Gametech" news page contains information about gaming technologies that attract users and keep their attention. It is made of pictures and text contents, which represents gametech news in the world and in our country. The about us page displays detailed information about website in the form of textual content.
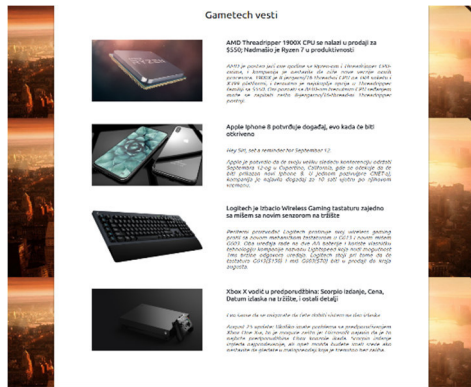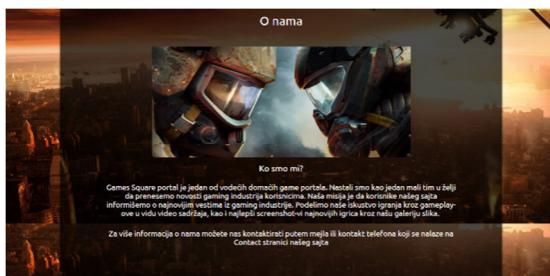

Figure 7.Appearance of Gmatech news page

Figure 8.Appearance of About us page

The „Games" page represents an informative page that essentially displays textual contents with pictures presenting detailed description of the latest video games titles.
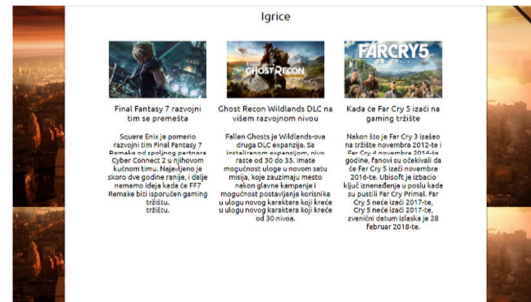

Figure 9.Appearance of Game page

On the separate „Video" page there is a video with latest trailers of video games and user can review those videos. There is also a possability to display a cinematic appereance of video that user can get full benefit on the website.
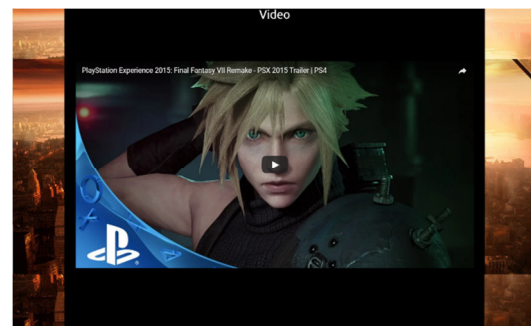

Figure 10.Appearance of Video page

The „Contact" page contains information about website that are very important for user to contact the website administrator at any time. Design of contact form is done using JavaScript and provides complete validation. Applying canvas animation inside the footer increses the users orientation towards the buttons that lead to social networks.
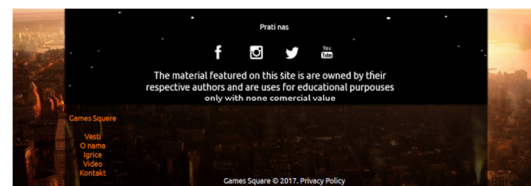

Figure 11. Appearance of footer with canvas animation

IV. PARTS OF CODE

This section explains parts of the code thatare very important for implementation of „Games squere" website. Very important thing is website optimization for differente devices, because

modern technologies requires such website settings. Figure 12. represents webiste optimization code at 640px, through responsive design.

```
@media screen and (max-width: 640px) {

.Contents {
  width: 100%; }

 .top-header {
 width: 100%; }

.MainMenu {
  height: 140px;
  width: 100%; }

.MenuItems {
  display: none; }
```

Figure 12.Part of code for optimizing size of website on 640px

```
function validateForm() {
if(!validateName() && !validatePhone() && !validateEmail() && !validateMessage()){
  return false; }}

function jsShow(id) {
  document.getElementById(id).style.display = 'block';}

function jsHide(id) {
  document.getElementById(id).style.display = 'none';}
function producePrompt(message, promptLocation, color) {
  document.getElementById(promptLocation).innerHTML = message;
  document.getElementById(promptLocation).style.color = color; }
```

Figure 13.Part of JavaScript code for validating contact form

V. CONCLUSION

With accelerated development of the web,average expectations about the level of websites functionality have also incresed. JavaScript and Jquery, as one of the very lightweight, but also the main languages of the web, provides a wealth of developer opportunities. The use of these tools is becoming more popular and every day developing more. Website „Games squere" is responsible to set of all these tools for developing websites. It also includes Photoshop, JavaScript, Canvas animation, HTML5 and CSS3 elements.

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Learning and Education in Smart Cities

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Abstract – We are living in a time of smart technologies when the concept of smart cities becomes more and more important and probably will be a generally accepted way of life in the near future. Technologies in cities should contribute and contribute to a higher quality of peoples' life. On the other hand, people must be ready and educated to adopt such a way of life.

This paper presents the achievements of technologies in smart cities, with particular reference to the situation in Serbia and Romania. It also indicates the forms of learning available and can be applied to city people so that they can take advantage of life in future smart cities.

I. INTRODUCTION

The achievements of information technologies have influenced on smart cities development, to the extent that they are becoming more and more reality and less and less a concept.

It is a fact that most people live in cities today (about 55% [1]), with forecasts that over 66% of them will be in the next two decades [1]. This will affect more pollution of soil, water and air and higher consumption of water, energy and resources. Those who live in cities use 75 percent of non-renewable natural resources and participate in the production of three quarters of global pollution. [2] The solution is in smart cities cities that effectively integrate physical, digital and human systems in order to build an environment that will contribute to improving the lives of citizens. [3] Accordingly, the need to train people to live in cities will increase, in order to be able to use all the benefits of the technologies that will be offered to them.

Information technologies in smart cities provide a higher quality of life for people in various areas: citizen engagement, construction and planning, standardization in financing and legislation, transportation and mobility, energy and watter supply, renewable energy sources...

The amount of data generated in smart cities is enormous and thanks to technologies (Internet of Things) will be available to citizens in a timely manner and it will make life easier for everyone. This primarily refers to the savings that will be

achieved in all areas of city people life: administrative, legal, health, public transportation, energy, and it will contribute to environment protection too.

Figure 1. Illustration of smart city [4]

This paper presents the characteristics of smart cities through examples and achievements related to their technologies in the cities of Serbia and Romania, as well as the directions of future investments. There is also a review of the possibilities of citizens' education for life in smart cities.

II. SMART CITIES IN SERBIA

In Serbia, it has been recognized that the support of city and state government is necessary for the development of smart cities, which is increasingly being realized through various projects of cooperation with foreign countries and companies. Among the first activities that contributed to the development of smart cities is certainly the launch of the eGovernment portal (2010).

The aim was to reduce the queues, avoid corruption and increase transparency and efficiency in the work of city administrations in Belgrade, as well as to encourage the development of electronic services in other cities. The eGovernment Portal (Figure 2.) has a Catalog of

Electronic Services of the City of Belgrade with 156 items of services that citizens can receive electronically, with a brief instruction. The service is designed exclusively based on the needs of citizens for specific services. It is fully developed in Serbia and using Microsoft BizTalk technology. [5]

Figure 2.   EGovernment portal

One of the important projects that our government signed at the end of last year is the memorandum on cooperation in the field of innovation and technological development with the Russian state-owned high technology development corporation. The agreement refers to the development and implementation of solutions for smart cities, as well as cooperation in the areas of IT and telecommunications, digitization of the economic sectors, implementation of smart technologies, development of science and personnel. [6]

Furthermore, in the efforts to create infrastructure for smart cities development, our government has signed a contract with Huawei company with whome it will work on the development of telecommunications infrastructure and broadband Internet [7] It will be the basis for deploying smart services across the country. The starting point will be safe cities, as citizens will thus feel how much smart infrastructure can be helpful to them, and they will turn to such solutions and start create their own smart homes. [8]

As it can be seen from the preveious, the city of Belgrade had the most actions towards the

development of smart cities. Examples of this are application "Bg portal", through which people in every moment can see where the constructions in the city are, as well as the application "Beograđanin", where citizens can propose activities and actions, but also to vote and participate in decision making. Also, thanks to the public company „Beoland GIS", citizens were given insight into possible construction at a specific location, in urban plans and further work. In addition, public transport and parking services have a whole range of applications. [9]

It is worth to mention the Geotelemark application, created by company Enetel Solutions from Belgrade, for geo-referenced business analytics. Publicly available data on school locations and traffic accidents in Belgrade were used, then data from automatic weather stations on air quality, as well as data from vehicles that were driving around the city. Beside location and speed, vehicle equipment also provided data on sudden braking, acceleration, high speed turning, and similar. The idea was to create a model that will indirectly influence the urban traffic route that will affect the increase in traffic safety and the preservation of the environment. [10]

In some cities there are systems for monitoring air pollution.

In Serbia, the attention to the development of smart cities is also given through the organization of various symposiums and forums on this topic, as well as visits to similar gatherings in abroad. [9-11]

Concerning education for smart cities, it has been recognized that e-trainings that can relate to education include: citizens, governance and business enterprises. [12] Accordingly, e-learning for smart education for building smart cities encompasses: coaching, teaching, knowledge, skills, development, learning, and workshop. [12] Games was used in some cases, for the purpose of education for smart cities. [1]

Considering the development level towards the smart cities in Serbia, the level of learning and education is "for beginners". On the portals of institutions that provide smart services, there are instructions and guides for various applications. Also, after installing smart devices, the training of staff is needed for the functioning of smart systems. On the other hand, in higher education, ICT education is tradition and in line with the latest achievements. Therefore, support for the

development of smart technologies and education for these technologies exists.

III. SMART CITIES IN ROMANIA

In Romania, the importance of smart cities has also been recognized and preconditions for their development have been identified. [13] Also, the Romanian government's support in the implementation of smart cities projects is significant. As in Serbia, the development of smart cities begins with the launch of the e-Government portal. For the municipalities in Romania electronic governance is a relatively new practice (the first national project on this theme was initiated in the year 2003 – www.e-guvernare.ro) and it includes digital governance (the offering of public services through electronic means) as well as digital democracy (citizen participation at the governance activity). [14]

It can be seen that there are several European projects that encourage the development of smart cities in Romania. Some of them are:

- Bucharest - A smart city project was launched in Oraselul Copiilor Park in Bucharest. The project includes smart parking, free Wi-Fi, and smart street lighting [15]

- Oradea - For the city to reach "smart" status, it plans to connect all of its public institutions to a single platform; [16]

Figure 3. Jednoa od rumunskih konferencija o pametnim gradovima

- Alba Iulia – With the help of telecommunications company Orange Romania, the city is serving as a pilot project for digital solutions. Orange Romania will provide Alba Iulia with an infrastructure platform that will connect objects with the help of 4G, LoRa, FTTH Fiber, Wi-Fi and Bluetooth; [16]

Furthermore, numerous conferences and symposiums on smart cities have been organized in Romania (Figure 3), which are, among other, intended for education and learning. [17, 18]

IV. CONCLUSION

This paper presents the characteristics of smart cities, especially with the achievements in this area in Serbia and Romania. It is pointed out to technologies that affect the quality of life of people in cities. It also pointed to the need to educate people to live in smart cities, as well as to the possible forms of learning for living in smart cities. Further research can determine which technologies exactly and to what extent are represented in Serbia an Romania, and what are the plans for further progress towards smart cities.

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Applied Strategies in the Development of eGovernment to the Republic of Serbia

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Abstract -The development and implementation of eGovernment provides users (citizens, businesses and state authorities) with the use of information and communication technologies (ICT) to obtain simpler, faster and cheaper public services in the form of eGovernment services. By using the Internet and computer or mobile device, citizens are enabled to realize certain services that are under the authority of the Government of the Republic of Serbia. In addition to this, citizens are still available public services in a traditional way, with more efficient implementation and without needing to visit multiple counters. It is also enabled to receive up-to-date, clear and detailed information about the service on the Internet. The Central Authority for the implementation of the Strategy and the coordination of the development of eGovernment was the directorate for Electronic Administration as a body within the Ministry of State Administration and Local Self-Government, and from the recent offices for eGovernment of the Republic of Serbia with the Government of the Republic of Serbia. Within the framework of each Strategy, there is Action Plan, which includes activities with defined deadlines and bearers to be implemented in order to achieve strategic goals.

I. INTRODUCTION

The strategy for the development of electronic administration in the Republic of Serbia (hereinafter: the Strategy) is an act of the Government, which defines in a comprehensive manner the basic goals, principles and priorities of improving the situation in this area and determines the activities to be undertaken in the forthcoming period.[1]

Electronic administration (hereinafter: eGovernment) implies the introduction of information and communication technologies (hereinafter: ICTs), which stimulate the functioning of the authorities and administrative bodies and enable their faster and better work in the function of governance, economic growth and reducing the burden of administration. ICTs are one of the key areas in the development of eGovernment.

When it comes to eGovernment, it is very important to emphasize that its development must follow certain legal regulations, and they often represent the main obstacle for the further development and implementation of eGovernment. The key issue that enabled the further development of eGovernment is the adoption of a law on electronic signatures [2]and an electronic document[3].

By registering certification bodies for issuing qualified electronic certificates, in December 2008, it was possible to use a qualified electronic signature for signing electronic documents, as conditions for their validity and probative force in legal affairs, administrative court and other procedures.[1]

When it comes to the Strategy, it is important to emphasize that its component parts are action plans. The Action Plan is an accompanying part of the Strategy and includes activities, activity carriers, deadlines for implementation, success indicators and financial resources necessary for the accomplishment of each of the activities.[4]

The situation in this area that was preceded by the Strategy of Development of Electronic Government in the Republic of Serbia for the period 2009-2013. years characterized:

1. Insufficiently developed common computer-communication network;
2. Underdevelopment of official records in electronic form, as the core data necessary for the development of electronic administration;
3. Mandatory use of paper documents in almost every procedure;
4. Insufficient standardization and coordination of the development of information systems in the authorities;
5. Lack of competent staff.[1]

II. THE STRATEGY FOR THE DEVELOPMENT OF ELECTRONIC GOVERNMENT IN THE REPUBLIC OF SERBIA IN THE PERIOD 2009-2013

The vision of the Strategy consists of general objectives, which are based on certain principles. The overall result of the Strategy should be to achieve the overall goals. Any activity that is being undertaken for the implementation of the Strategy must have certain priorities that are grouped into development pillars. All these priorities are an integral part of the action plan defined by this Strategy.
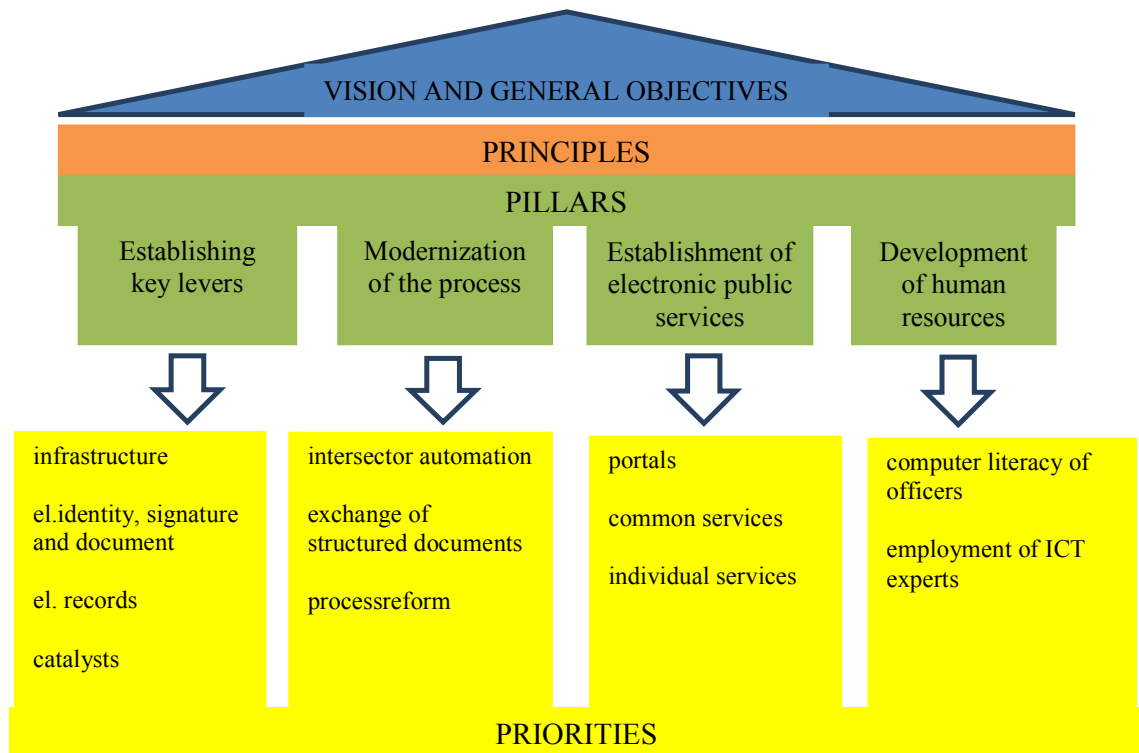
Figure 1. Structure of Strategy implementation [1]

A. Establishing key levers

It represents system solutions without which the successful development of eGovernment would not be possible. The following priorities are included under this pillar:

- ICT infrastructure, it represents the basic technological solution for the development of eGovernment and includes:

  o communication infrastructure, which enables the connection between state authorities via computers and the Internet;
  o computer centers with servers where the data will be stored for the realization of electronic services and execution of certain applications;
  o infrastructure at certain locations, which includes local computer networks, computers, computer equipment and software.

- Electronic Identity, Electronic Signature and Electronic Document. It is very important to ensure the accurate identification of the signatures of the electronic document and the users of the electronic service. Electronic signature technology is the basis for this. In order to use the electronic document in practice as an original instead of a paper document, it is necessary to achieve the full implementation of the electronic document law;

- Electronic official records represent the keeping of records in electronic form. They provide safe and effective access to information to the officers, as the party in the proceedings would not have the need to obtain evidence of the facts from the records;

- Catalysts of eGovernment development, which represent the emergence of a better environment for the development of eGovernment and lead to increased economy, innovation and security.

B. Modernization of the process

The maximum use of ICT capabilities should enable the modernization of public service processes. The following priorities are included under this pillar:

- automatization of inter-sectoral processes based on the exchange of structured electronic documents. It is necessary to make an electronic document suitable for automatic processing, well-standardized protocol and form of a structured document represent the basis of automation of inter-sectoral processes;
- process reform, which implies a different way of work that modern technologies allow to us.

C. Establishment of electronic public services

The following priorities are included under this pillar:

- eGovernment portals and common electronic services. Portals represent a unique point of access to a growing number of electronic public services.[1] Common electronic services include services that are of great importance for the delivery of many services, such as a central identity system, electronic forms, electronic payments, etc.;
- electronic public services, they are under the authority of certain authorities and are provided electronically. There are 12 priority electronic public services for citizens and 8 for business entities.

D. Development of human resources

By training officers, who use information systems and electronic services within the state administration and experts responsible for technical support of the system and its functioning and improvement, a successful development of eGovernment is achieved.The following priorities are included under this pillar:

- IT literacy and skills of officers;

- employment of ICT experts, in order to ensure that the use of ICT in eGovernment is sustainable, it is necessary to establish ICT support teams and have an ICT expert.

III.   THE STRATEGY FOR THE DEVELOPMENT OF ELECTRONIC GOVERNMENT IN THE REPUBLIC OF SERBIA IN THE PERIOD 2015-2018

The strategy was adopted on December 17, 2015.It is created from the strategy of public administration reform and defines the basic goals, principles and priorities of improving the state of eGovernment and influences the development of ICT society in the areas of public administration, health, education, judiciary, social policy, public procurement, data security and electronic transactions, and accessibility, as well as the development and use of open data held by public authorities.

A. Establishment of an institutional and rounding-up of a legal framework for ensuring coordinated governance by eGovernment development

In order to better implement the Strategy and execute the Action Plan, the Public Administration Reform Council establishes a Working Group for eGovernment. The Working Group is tasked with collecting reports from the carrier of progress activities and, depending on these reports, may propose the adoption of the necessary amendments to the Action Plan. Depending on the needs, the Working Group is divided into subgroups, such as: subgroup for regulations, infrastructure, electronic services, local self-government, and others. Professional, administrative and technical tasks for the needs of the Working Group are performed by the Directorate for eGovernment[4] The Directorate for eGovernment is obliged to establish contact with the persons in charge of development of eGovernment from all relevant ministries of the Government of the Republic of Serbia.
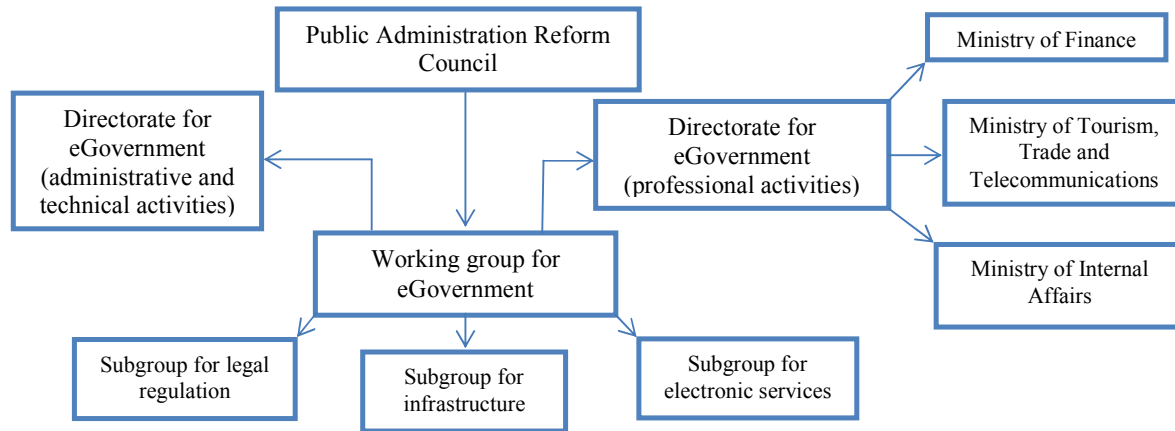
Figure 2.eGovernment institutions [4]

The adoption of the Law on eGovernment and the Law on the Single Register of Citizens is a key result of this goal. [4] In addition, it is necessary to harmonize the Law on Free Access to Information of Public Importance with the Directive on the re-use of public sector information with the regulations of the European Union.

B. Establishment of interoperability between information systems of state administration bodies, autonomous province bodies and local self-government units

Establishment of interoperability [5,6] of various information systems of public administration bodies, autonomous province bodies, and local self-government units and their web services presents the linking of information systems of public administration bodies to an unique Government Service Busfor the purpose of establishing communication through the state communications network.[4] Because of the aforementioned things, it is necessary to prescribe the rules for the use of the eGovernment server and network infrastructure.

By implementing international standards and enrolling in the International Registry of Qualified Certificates, in order to enable the use of electronic identity, cross-border interoperability is established.

C. Establishment of basic electronic registers related to other information systems of state bodies, autonomous province bodies and local self-government units

Creation of key registers: Register of citizens, Register of spatial data, Address register and improvement of existing ones: Register of real estate cadastre, Register of economic entities, and their connection with information systems of government administration bodies, bodies of autonomous province and local self-government units creates electronic registers.

D. Establishment of new electronic services on the national eGovernment portal and other portals

Taking into account the international standards of security and privacy of data and user needs, new electronic services will be implemented at the national eGovernment portal. The national eGovernment portal will require the adjustment of organizational processes with the use of ICT and will enable citizens a simple and efficient service as well as reduction of corruption.

E. Training of employees in the state administration for the use of ICT

As eGovernment is based on ICT and used in daily activities within the public administration, it is necessary to conduct continuous education of employees in the area.

F. Establishment of open government

Providing open government is achieved through the opening of data from public administration bodies and increasing transparency of work.[4] The establishment of an open government aims to enable the use of data sets of public government for commercial and non-commercial purposes, which would enable the creation of new electronic services. This concept would also enable free use and reuse of some data and information, transparency of administration, more efficient performance, opportunities for creating new jobs and employment. According to the World Bank estimates, opening data at the European Union level would increase business activity up to 40 billion euros a year, and it is estimated that 80% of the total benefits from the

opening of data are directly received by citizens, the business sector and investors.[4]

IV. FINANCIAL EFFECTS OF THE STRATEGY

The funds for the implementation of the Strategy are obtained from the budget of the Republic of Serbia, in addition to these funds there is the possibility of obtaining additional funds from foreign funds or through donations.

Government measures against the economic crisis have led to the use of budgetary funds previously foreseen for that budget year and the next two fiscal years for the implementation of the Strategy.

As eGovernment is based on ICT, its development leads to significant indirect savings by reducing: cost of printing and delivery of documents, courier services, dispatch and receipt of documents, tasks related to the issuance of certificates from official records and other tasks that will be facilitated by the Strategy.In addition to these costs, the costs of the companies will also be reduced as this will enable them easier and cheaper communication with the state authorities.

V. CONCLUSION

The Republic of Serbia has made significant progress in the creation and development of eGovernment in the period from 2009 to 2013 and the period from 2015 to 2018. In a more detailed overview of the Strategy and Action Plans, we can conclude that there is a big difference in the implementation of electronic services and the use of ICT within government bodies, some of them have already reached a high level of application of eGovernment and services to users, while some are only starting with the use of electronic services.

The key issue that enabled the further development of eGovernment is the adoption of a law on electronic signatures and an electronic document. In order to accelerate the development of eGovernment, it is necessary to develop a

common computer-communication network, provide electronic data records as a core of data necessary for the development of electronic administration, to circumvent paper documents in all procedures, standardize the development of information systems in the authorities and train competent cadres.

The pillar of process modernization is a reform of the process of providing e-services using all the opportunities provided by ICT. It is necessary to enable full automation of the creation of electronic documents, their storage and further electronic processing.

In addition, it is necessary to raise the awareness of citizens and certain state authorities about the importance of development and implementation of eGovernment. Using ICT within e-government should lead to a reduction in paper documents and simplification of administration, which will increase the satisfaction of all users of electronic services. It is necessary for citizens to be informed about the advantages and benefits of using e-government, which leads to a reduction in the cost of printing and delivery of documents, courier services, dispatch and receipt of documents, tasks related to issuing certificates from official records and other jobs. The costs of the company are also reduced, as they have been given easier, faster and cheaper communication with the state authorities in this way.

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