

School Management Improvement - Pedagogue Information System

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Abstract - This paper describes a prototype of school pedagogue information system with basic purpose to show that the elementary school management can be improved. This prototype is developed through system analyses, models generation and software implementation. Relational database was created in MySQL database management system for the purpose of storing necessary data for school pedagogue work. Web application was developed in PHP programming language with intensive usage of HTML/CSS/JavaScript technologies. Further system development and possible upgrades are also commented.

I. INTRODUCTION

Information system (IS) is every system which elements and the whole system with its environment communicates by exchanging data and information. It is an organized collection of methods, processes and operations for data gathering, storing, manipulating and information transmission through organizations including the software, hardware, org-ware and life-ware. [1] [2]

Information systems can be used as a decision support system and for realizing the basic enterprise functions. Every elementary and high school as a social well-organized system must have an information system supported by information and communication technology (ICT).

IS development is a process of transforming concepts from the real world to various models that can be implemented in a form of solution through activities like: user requirements specification, future model design, process models, data models, object oriented models, technical specifications, program specification etc. [3] [4].

II. RELATED WORK

Information systems enable countries and school authorities for better efficiency in education planning, strategical planning, and schools monitoring.

For example, in paper [5] is presented Education Management Information System (EMIS) developed in Philippines. This program helps policy makers to

manage an education system. Through eight modules it provides information to education administrators in the planning and delivery of educational services. This was enabled with data collection, processing, dissemination, and utilization. Activities supported with EMIS are suitable for planning, implementation, monitoring and evaluation of school operations. EMIS implementation in all levels and types of schools' lead to sustainable quality education and performance.

According to [6] school information systems is a set of three sub-group of management information systems that are used in educational organizations. In schools there are distinct information systems support different types of decisions:

- administrative information systems (budget, schedule, timetables, student records).
- learning management systems (groupware, e-learning, learning management system).
- assessment information systems (test data, assessment data, grades).

Usually, the school management must work with several IS with different purposes that are compatible in limited ways.

“An information system based on one or more computers, consisting of a data bank and one or more computer applications which altogether enable the computer-supported storage, manipulation, retrieval, and distribution of data to support school management.” [7]

Today, educational institutions are looking for an optimum distribution of resources for achieving maximum benefits to students, teachers, and the management. In the contemporary world with high educational demands, management information system (MIS) is a system that these institutions need to have with basic aim to put their progress in the right direction. A MIS has a central data repository capable for gathering, organizing, and storing data and processing and analyzing, as well as generating

various reports from it. Education management information system is designed to monitor the performance of education programs and to manage the distribution and allocation of educational resources. [8]

Integrated web-based school information management software is presented in [9]. It has an educator's web-based program for schools which is an integrated database that connects school and students, family, and staff.

III. SYSTEM ANALYSES AND DESIGN

According to [4], information system development is divided into several phases:

- Planning (project identification, economic feasibility, workplan, tasks, staff).
- Analyses (requirements, model process, data model, use cases).
- Design (architecture, interface, program, databases, files).
- Implementation (programming, testing, installation, documenting, maintaining).

From related work it can be conclude that the job of school pedagogue is not covered in information systems. Planning this IS was based on school pedagogue work description and information needs for achieving maximum benefits to students, teachers, and the management. This system must have a database that stores data about students, teachers, and classes [7]. Data from this database must be inserted, updated, or deleted with web application that is easy for maintaining and installation. Most of programming languages in this area belongs to free and open software community, so the cost of development is minimal. Various reports were needed and possibility to create reports that can be printed or saved in electronic form like PDF format.

School pedagogue work description - before the beginning of each school year, the Ministry of Education sends new curricula to schools or confirms the old ones, after which they are taken over and recorded by the school pedagogue. Pedagogue then classifies teaching obligations by ability into three categories (below average, average and above average) and sends them to teachers. The pedagogue records the basic data on enrolled students and opens a pedagogical "file" of students. Pedagogue receive information about the students from the school secretary. The student file is appended with data about the social position of students, which they received from parents, and then obtaine data with psychophysical tested data and

mental abilities. Pedagogue processes all this data and send it to class teachers and teachers for inspection. During the school year, pedagogue records the school work of students based on the data from the diary entered by teachers and sends information to the Ministry of Education on the general success of students in the school, by grades, subjects and categories. Then, at certain intervals, it analyzes the stored data together with the data on the students' abilities and make conclusions about the interests and behavior of the students, which it then gives to the teachers for insight, as well as information about the general success. Also, concludes about the problems of students of any kind and informs the class teacher and parents about it and provides adequate help and support. The task of the pedagogue is to solve the observed problems. Starting from the teaching obligations given by the curriculum and the need for new information from the pedagogical and psychological profession (professional seminars, symposia and lectures organized by the ministry, university, institute, etc.), it collects appropriate documentation and literature and records it. Pedagogue then analyzes it, draws conclusions from individual sources and makes a preliminary decision on their possible impact on the teaching process, and then makes modifications to the curriculum within the limits allowed. He sends these changes and proposals to the teachers in charge of specific subjects, classes and classes to which the changes apply.

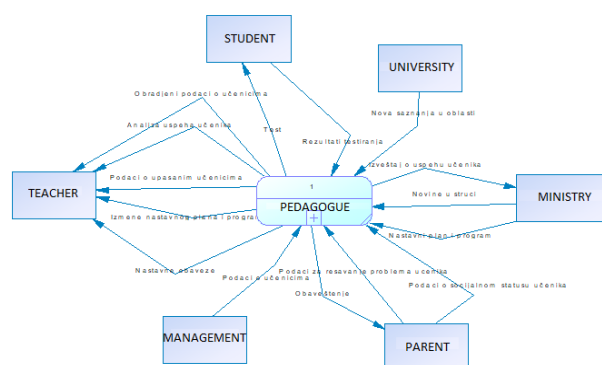


Figure 1. Business process model – main diagram

In the process of IS development, in analyses phase, were created models suggested in [4]: business process model (BPM), conceptual data model (CDM), physical data model (PDM), object oriented model (OOM) with use case and class diagram.

Figure 1 shows process model as a business process model first diagram that is called the context diagram. This diagram shows external data flows and external systems and subsystems called entities

that are in interaction with school pedagogue. This diagram of a model defines a system boundary.

Figure 2 shows decomposed process from figure 1. On this level were identified basic functions: school year preparation, work during the school year, and improving plans and programs.

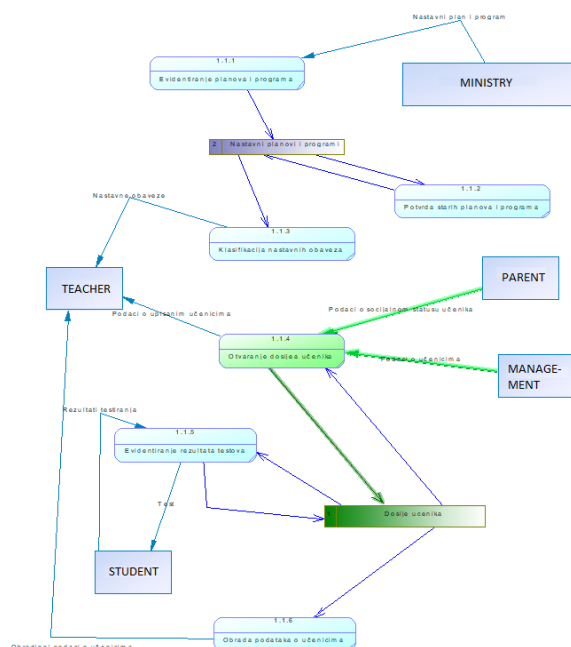


Figure 2. Business process model diagram

List of organized tasks performed by the school pedagogue are presented as data processes in this model which should be supported in new software:

TABLE I. PROCESS TREE

	Basic function	Elementary and primitive business process
1	School year preparation	<ol style="list-style-type: none"> 1. Recording plans and programs 2. Confirmation of old plans and programs 3. Classification of teaching obligations 4. Opening students' files 5. Recording test results
2	Work during the school year	<ol style="list-style-type: none"> 1. Student data processing 2. Analysis of students work and progress 3. Forming a report to the ministry
3	Improving plans and programs	<ol style="list-style-type: none"> 1. Collecting new knowledge documentation and literature 2. Curriculum changes

Next activity in IS development is designing data models. Two models are important: conceptual data model and physical data model. Conceptual model is abstract and independent from the implementation. Entities are defined based on data stores from previous model and data dictionary structure. Entities has attributes, identification attributes that are unique, established connections between entities, cardinalities and constraints arising from business.

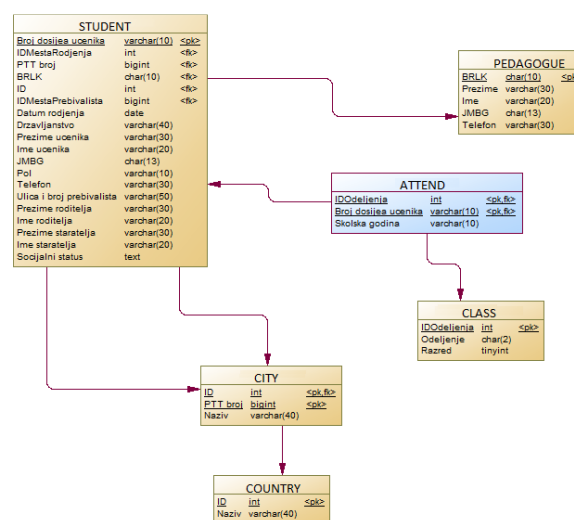


Figure 3. Physical data model diagram

Physical data model with its characteristics that correspond to relational database management software presents an appearance of database after implementation.

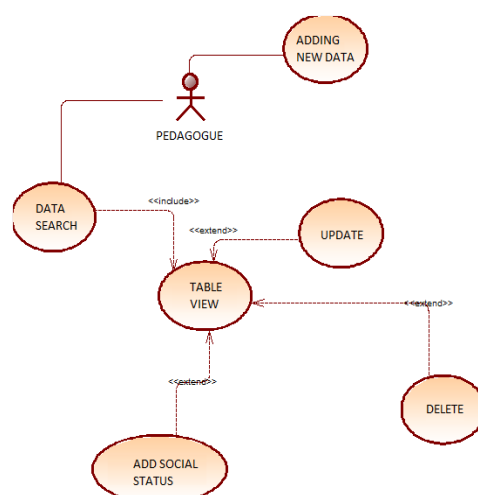


Figure 4. Use case diagram – Pedagogue software functions model for entering new data

Object oriented model of future software is based on the business process model process tree presented in table I, job description, requirements, and data models. It is done through the set of use case diagrams, where one of them is shown on figure 4.

This set of diagrams defines menus content, main menu items, as well as individual web pages functions with options available to the end user, i.e. pedagogue. Class diagram is done from data models and operations defined in business process model.

IV. IMPLEMENTATION

Implementation is based on all previously created models that are result of the design phase of IS development. Software was realized in PHP programming language with intensive usage of hypertext markup language (HTML), cascade style sheet (CSS), and JavaScript technologies. Web application was created as a solution that is nowadays programmers often use in the ICT world, together with mobile applications. Data models were implemented as a relational database created in MySQL database management system with PhpMyAdmin web application.

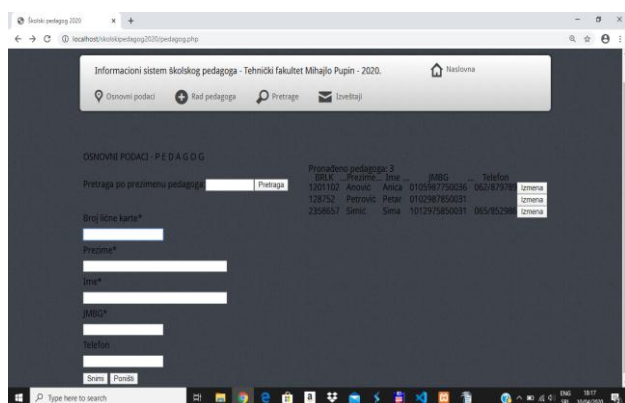


Figure 5. Web application page for entering data

Main menu is a drop-down style menu that has following items: basic data, pedagogue work, data search, and reports. Basic data menu items are pedagogue, teacher, city, country, class, and institution.

Pedagogue work menu has items defined from model process tree presented in the table I.

Database data entry for adding new pedagogue for example was realized with web pages that have forms for entering data like that is shown on figure 5. Source code for just a small part of this form in HTML language is:

```
<form action="pedagog.php" method="Post">
<table>
<tr style="float:left; clear:left; margin-top:10px;"><td>First name*</td>
<td style="float:left; clear:right; margin-top:10px;"><input type="text" name="firstname" maxlenth=30 size=40 required tabindex=1></td></tr>
<tr><td>
<input type="submit" name="save" value="Save" tabindex=6>
<button type="reset" name="reset" tabindex=7>Reset</button>
</td></tr> </table>
```

Users enter data in controls like input box, date time picker, list entry, etc. The entered values are stored in variables that are sent to other or same pages using the POST method and object. On second web page, data from variables are retrieved into the second set of defined variables. Next step is opening the connection (with four parameters: server name, user name, user password, and database name) to the database with the mysqli_connect PHP function, creating the the insert SQL statement which is then executed with the PHP built-in function mysqli_query. Messages are necessary for informing the user what happened at the end of execution of this software function. For this purpose was used echo command.

```
<?php
$server = "localhost";
$user = "root";
$password = "";
$database = "pedagogue2020";
$brlk=$_POST['brlk'];
$lastname=$_POST['name'];
$firstname=$_POST['firstname'];
$jmbg=$_POST['jmbg'];
$tel=$_POST['tel'];
$dbconnection=mysqli_connect($server,$user,
$password,$database);
if(!$dbconnection)
{echo('No connection with the database server!');}
else
{$query="Insert into pedagoguetable values
('$brlk','$firstname','$lastname','$jmbg','$tel')";
$resultset=mysqli_query($dbconnection,$query);
if ($resultset)
{echo "pedagogue ".$firstname." ".$lastname."
successfully added into the database!"; }
else
{echo " pedagogue ".$firstname." ".$lastname." not
successfully added to the database. Error, check the
data entered on previous page!"; }
}?>
```

Updating and deleting entered data from the database is done like the previous input with difference in the SQL query only.

The SQL query for updating pedagogue data in the database:

```
$query="Update pedagoguetable set brlk='$brlk', fir  
stname='$firstname, name='$name, JMBG='$jmbg',  
Telephone='$tel' where brlk='$id';";
```

The SQL query for deleting data about the student from the database:

```
$query="Delete from `studenttable` where `brdos`=  
$brojdos;";
```

Data search as a very important task in IS. It was done by entering the criteria for search in a small web form. Then the PHP page was reloaded and checked whether the search button is pressed with the previously mentioned post HTML method, and if it is pressed then the search word is retrieved from the post method variable, the connection to the database was established, SQL select statement was formed and finally executed on the same way as it was done for insert.

Select SQL query example:

```
$query="Select * from studenttable, city, country w  
here studenttable.RBa=City.RB and City.ID=Count  
ry.ID and `brdos` like '%$search1%' and `firstname`  
LIKE '%$search2%' order by `firstname`  
, `Lastname`";
```

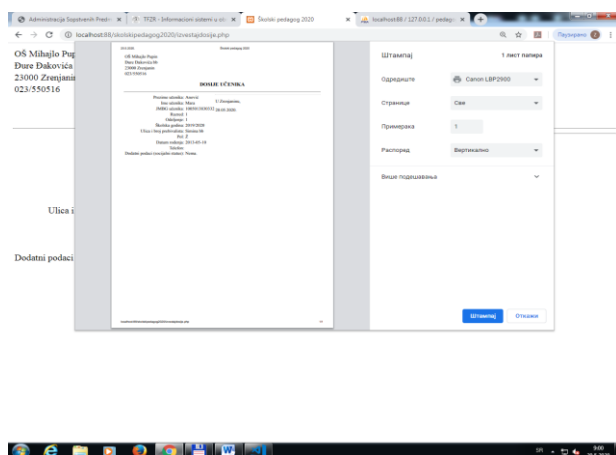


Figure 6. Report generated in IS web application

Reports are done as a printer-friendly pages without web design elements with white background

color. Data on this pages are displayed in tables without borders with <table>, <th>, <tr>, <td> HTML tags. Working data that was read from database on the same way as it was done for data search.

V. CONCLUSION

Pedagogue information system could be used to improve the school management work because it is suitable for planning, monitoring and evaluation of school operations.

It was developed as a teaching example at University of Novi Sad, at Technical faculty "Mihajlo Pupin" in Zrenjanin, during the realization of the "Information systems in education" course on the final, fourth year of study at bachelor's degree.

Further system development could include programming the mobile version of application for Android and iOS operating systems.

Upgrading function could be multiuser function with authentication and login form at the beginning, so two or more pedagogues or other users could use this information system.

REFERENCES

- [1] Lj. Kazi, Z. Kazi, B. Radulović "Information systems 1 & 2", University of Novi Sad, Technical faculty "Mihajlo Pupin", Zrenjanin, 2013. (on Serbian)
- [2] B. Radulović, Lj. Kazi, Z. Kazi "Information systems – selected chapters", University of Novi Sad, Technical faculty "Mihajlo Pupin", Zrenjanin, 2011. (on Serbian)
- [3] Lj. Kazi, Z. Kazi, B. Radulović, D. Radosav "Evaluation of Models in Information System Development", 14th DQM International Conference Dependability and Quality Management ICDQM-2011, Beograd, Serbia, Proceedings pg. 589-595, 2011. (on Serbian)
- [4] A. Dennis, B.H. Wixom, R.M. Roth "Systems Analyses and Design", John Wiley & Sons, Fifth Edition, 2012.
- [5] O.L. Cuartero, M. Role "Educational Management Information System (EMIS) in Public Elementary School", International Journal of Scientific Research and Management (IJSRM), Volume 6, No. 6, pg. 452-462, 2018.
- [6] A. Breiter, D. Light "Data for School Improvement: Factors for designing effective information systems to support decision-making in schools", Educational Technology & Society, Vol. 9, No. 3, pg. 206-217, 2006.
- [7] A.J. Visscher "Computer-Assisted School Information Systems: The Concepts, Intended Benefits, and Stages of Development", Information Technology in Educational Management: Synthesis of Experience, Research and Future Perspectives on Computer-Assisted School Information Systems, Norwell, MA: Kluwer, pg. 3-18, 2001.
- [8] B. Korde "Role of Management Information System (MIS) in Education Sector", 2018.
- [9] School Information Management System & Website Software, PCR Educator.