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INFORMATION TECHNOLOGIES IN CONTEMPORARY SCHOOL MANAGEMENT SYSTEM, CASE STUDY

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Abstract: *Improvements within the management system of schools as part of an ongoing process of improving the education system, have reached a certain level. This paper aims to observe modes, levels and specific problems in application of information technologies in informing, information sharing and collaboration as important aspects in ensuring quality in control of the processes that occur at school. Some deficiencies in application of information technology within these processes have been identified, and alternatives to solving them have been offered. The solution discussion was performed according to the parameters that were extracted as important in the problem analysis. A school that is recognized in Zlatibor region and elsewhere in Serbia for its advanced development tendencies was selected for the case study. The proposed solutions are practically applicable in any work collective.*

Key words: *management, education, information technologies, groupware software, teamwork*

1. INTRODUCTION

As Stjepan Staničić pointed out in his Current trends in school management, management in education can be defined as coordination of human, physical and financial resources in the education sector to achieve the goals set by the state, local and school educational policy, legislation system and concepts and projections of the education development (Staničić, 2008).

Modern approach to the development of schools, especially in terms of quality assurance of the processes that take place within the institution, requires also the development of appropriate software solutions for effective monitoring and control of the process. The school managements in Germany, Denmark, Ireland and the Benelux countries apply special software for the process management, which allows simultaneous monitoring and coordination of different processes, ensuring optimization of the schools' functioning. (Rottluff, 2008)

Previous efforts for a more intensive application of information technology in the educational system of Serbia involved the application of various software solutions and internet in teaching, electronic Grade Book, accounting programs, e-mail application, the application of EIS and others. New products constantly come onto the market and in combination with existing products realize a new functionality (Saračević & Mašović, 2011). This paper will show the current status and ways of monitoring several distinct processes within the school and offer several solutions for improvement.

2. GENERAL OVERVIEW OF THE COMPANY

It was on February 27, 1960 when Technical School Užice was opened. Its establishing emerged from the need for education of personnel for the economy and public services in mechanical, electrical, metallurgical and construction sectors. In 2010, it celebrated its fifty year anniversary. The period from the year 2002 on has been marked by participation of the school in various projects, intensive arranging and equipping of the school, the introduction of new educational profiles, but also by continuous training of teachers in modern teaching methodologies.

Several years back, there have been from 1050 to 1150 students in the school; this academic year the enrolled students attend classes in 40 regular classes, whereas there are 32 in the four-year education (11 pilot classes) and eight classes in the three-year education, including two experimental ones. In 2003, the school entered the first phase of the Reform of vocational education in which, through CARDS I, the European Union through the European Agency for Reconstruction and Development financed the reconstruction of the school building, procurement of modern teaching devices and equipment for experimental educational profile – a machining operator, but also the training for modern methods of work

within the school. Internal and external carriers of change, in addition to the director, passed a series of seminars that helped the employees start using new ways of working in educational practice. In August 2006, the school entered the second phase of the Program of reform of vocational education as one of four schools in Serbia, where the European Agency for Reconstruction funded the introduction of new educational profile in the sector of information - communication technologies, a telecommunication electrician. The program was successfully completed in May 2008. Apart from the obtained equipment, the teachers have undergone a series of training that enabled them to apply modern forms of work in their teaching, aiming at gaining functional knowledge by the students and facilitating their involvement in work after they complete secondary education. A Seven-member school delegation paid a study visit to the Vocational school, "Otto Brenner" in Hanover in October 2007.

Technical School Užice was the Saint Sava award winner for the year 2006. Serbian Chamber of Commerce and Regional Chamber of Commerce Užice awarded Technical school the plaque for its contribution to the economic development of the region and the Chamber system in 2007 and the plaque "Captain Misa Anastasijevic" for the results achieved in the promotion of entrepreneurial culture and creativity in 2009.

At the moment, the school is implementing the project "Regional centers of competence ReCeKo - Serbia" in which the school has been involved since September 2009 as one of 12 schools in Serbia. The project aims to develop vocational schools into the regional centers of competence for vocational education. The project is being implemented in cooperation with the Ministry of Education and with the financial support of German organization for technical cooperation - GTZ. The school delegation visited "MM school for multimedia and information technology" in Hanover, Germany, which should become a partner school in the project realization. Since March 2010, the school has been involved in the project "Modernization of Vocational Education" implemented by the Ministry of Education with technical and financial support from the European Union (IPA 2007), as a continuation of the Program of reform of vocational education, whose three phases were implemented over the past six years. The school is undertaking activities to include itself into the program International recognition for young people - MEPI.

During the past decade, the school timely recognized modern tendencies in the development of vocational education and engaged itself in many projects - so today Technical school is recognized in the wider region for its work and success.

3. SPECIFIC FIELD OF OPERATION

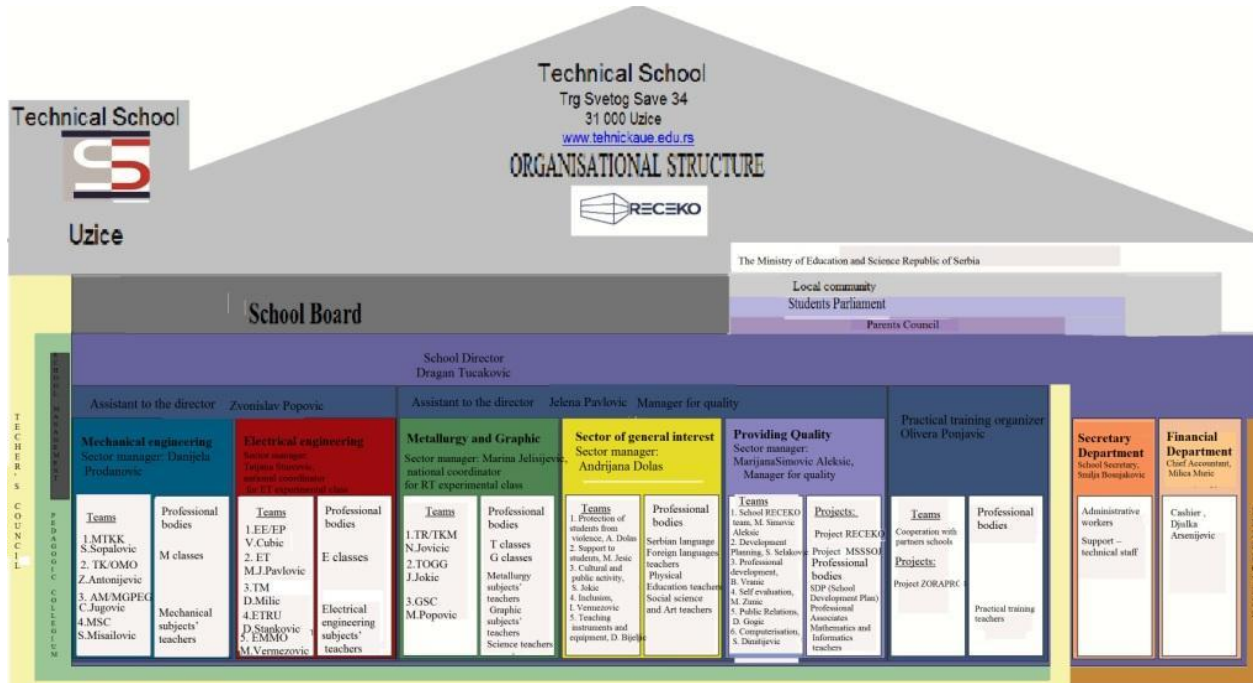
The fields of education and service delivery in education today differ much compared to the ones that existed several years ago. According to the current Strategy for the Development of Vocational Education in Republic of Serbia, adopted by the Government, institutions for vocational education and training develop and implement programs and modules of various types in accordance with appropriate standards, i.e. programs of initial vocational education, trainings and programs for professional development and knowledge updating, which are customized and intended for different target groups (youth, adults, employed, unemployed, people with special needs). The ultimate goal remained the same - successful student and successful teacher; however, the methods used to obtain these, roughly called, "final products" are significantly different than they used to be. The school management has to select the most productive methods to achieve the ultimate goal.

4. SPECIFIC DECISIONS AND PROBLEMS

Quality improvement and modernization of educational work in secondary vocational education involves the introduction of new program contents and organizational innovations (Kömlenović, 2004). Being aware of the specificity of educational activities, but also the historical and cultural heritage, it should be noted that the introduction of innovations, which go beyond the usual understanding of school, is a potential source of problems. In this context, the imposition of new standards in communication between the subjects of the educational process will be one of the challenges for the transformation of schools in Serbia. Therefore, the development of activities to implement the measures in terms of improving educational services, in addition to finding optimal organizational and methodological solutions, must be accompanied with aspects of motivating all subjects as well.

4.1 THE CHANGE OF THE ORGANIZATIONAL STRUCTURE

In accordance with ReCeKo project which anticipates introduction of innovations in the areas of organization, management and financing of vocational schools, the following organizational structure of the school was established in 2011:



Picture1: Organizational structure of the Technical school Uzice

Managers were appointed, teams were formed, the new structure became established and key performance indicators were put in place in accordance with the ReCeKo project:

- Self-responsible school that in measurable way, constantly improves the quality of its work and contributes to regional economic development.
- More intensive and better direction of learning opportunities of vocational schools in Serbia to local and regional needs
- Standardization and quality in accordance with the EFQM model

As it was said in case study Building high performance teams, done by the firm Human Synergistics With the overall aim of developing a culture of collective achievement, the focus is 'empowerment', 'personal responsibility' and 'team decision making', which is completely applicable here. Overarching this is a clearly defined set of 'core values', designed to guide everyone's behavior. These are: integrity, participation, teamwork, continuous innovation and personal development.(Human Synergistics, 2010)

The new organizational structure of management in its first year of implementation has led to a more efficient division of labour in comparison to the previous organization, as well as to a layered division of responsibility, which was the objective. However, some problems in the lower layers of the organization were reported.

The critical issue here was the need to take on more staff to meet increasing volumes, but at the same time reduce expenditure. The two were clearly not entirely compatible unless something is changed in the way the operations were managed. Put bluntly, there needed to be a profound increase in productivity.

4.2 PROBLEM ANALYSIS

Before approaching the observation of problems involved with the process of organizational adaptation of the education system at the level of basic organizational unit such is a school, it is necessary to review the resources which Technical school in Uzice brings into this process. Bearing in mind that communication -

information aspects of education have a significant place in the considered changes, a particular attention has been paid to the information - technology and multimedia resources.

The school has following resources:

▪ **Human resources:**

Table 1: Human resources

Professional profile	Number of executors		Education degree							
			VII2	VII1	VII	VI	V	IV	III	I
Teaching staff	Teacher	94,7	1	1	82,3	9,4	1			
Internal and external change carriers	Internal	0,2			0,2					
	External	0,2			0,2					
Managing staff	Director	1			1					
	Assistants to the director	1,5			1,5					
	Practical training organizer	1			1					
	Sector managers	1,5			1,5					
Professional associates	Psychologist	1			1					
	Pedagogue	1			1					
	Librarian	2			2					
National coordinators for experimental classes	Electro-Telecom technician	0,3			0,3					
	Recycling Technician	0,2			0,2					
Administrative staff	Secretary	1			1					
	Administrative workers	1,5						1,5		
Financial staff	Chief Accountant	1						1		
	Cashier	1						1		
Support technical staff	Caretakers	2					1	1		
	Hygienists	14								14
Total executors		125,1	1	1	93,2	9,49,4	2	24,5	4,5	14

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▪ **Material-technical resources:**

Table 2: Material-technical resources

Resource	Total no	Area (m ²)
Classrooms	11	487
Specialized classrooms	19	1150
Laboratories	8	372
Workshops	5	440
Gym block with two rooms	1	653
Library with reading room	1	70
Conference hall	1	35
RE-CE-KO office	1	35

▪ **Information - technology (IT) and multimedia equipment**

Table 3: Information-technology (IT) and multimedia equipment

Type of equipment	Where is it used?	Number of items
Personal Computer	in teaching	105
Personal Computer	out of teaching	18
Video beamer	in and out of teaching	4
Graph scopes	in teaching	6

For monitoring and controlling of the processes that are happening in the school Director, sector managers and team leaders use the same tools as the employees use to exchange information and for being informed generally:

- meetings and telephone as key players
- electronic mail as a further step
- shared folders within the network (it is used by a small percentage of employees)
- web site: www.tehnickaue.edu.rs

The employees are accustomed to all these ways of communication. In most cases, all participants must be at the same place and at the same time.

The analysis of the school specificities in terms of :

- existing resources
- the organization of the lessons (work in two shifts)
- schedule mismatch of the teachers – teams' members
- communication styles
- specific obstacles faced by employees in their work

the following problems are distinguished:

1. teachers don't have their own space to work
2. insufficient number of computers for teachers' needs
3. educators perform major part of their work on professional preparation and responsibilities as members of the teams out of the institution
4. team meetings are held mainly in the evening, after the afternoon shift, when the efficiency of employees is significantly reduced
5. the employees stress unsatisfactory level of mutual communication and cooperation
6. the employees stress unsatisfactory level of communication and cooperation with other structures in the school
7. the employees stress unsatisfactory level of communication and cooperation with clients and parents
8. lack of interactivity of the school's web site
9. inertia of the education system in the procurement of new computer equipment

The question is whether it is possible:

- That each employee achieves the established 'core values'
- To achieve effectiveness of teams
- That the team leader has a good insight into the work of his/her team
- That the sector manager has a good insight into the work of teams.
- That the school Director has a good insight into the work of sector

without use of the advanced information and communication technologies? Because only high-quality, accessible and maintained information may be key to business success .

E-mail, though very effective, has a number of limitations; shared folders also have a number of flaws. Unfortunately, the experience gathered in recent years clearly shows that for modern and efficient school operations former selection of the information and communication technologies is less and less sufficient.

It is time to move a step forward.

5. ALTERNATIVES

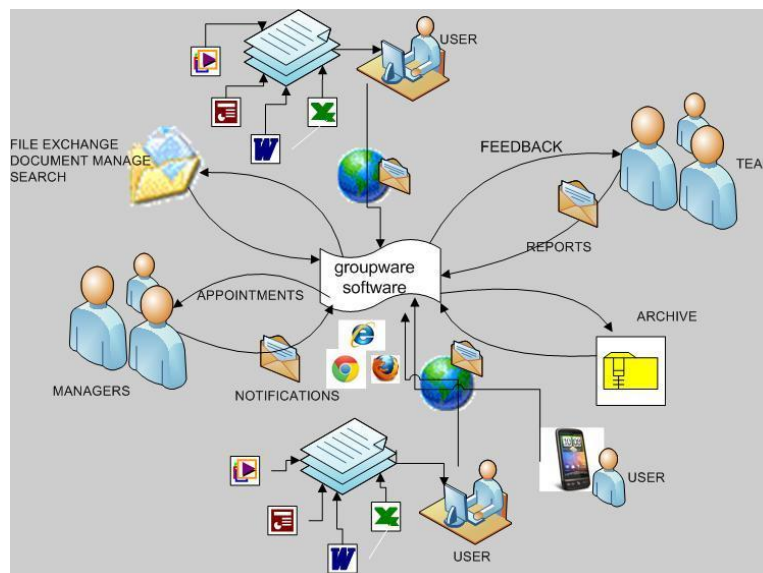
What is needed for more efficient operation?

- Document Management
- Information management
- Projects Management

It can be performed by certain software, let's call it "collaboration software", the software that raises the level of communication within the organization, regardless of whether it is the: client-server architecture, solutions based on Web technologies, solutions, whose use is enabled through the Cloud.

The software should solve several problems:

- the availability and reliability of information
- ease of monitoring more activities that are performed at the same time
- document management, and just as importantly, organized and safely stored business information which can be used to analyze previous business results and allow making better business decisions



Picture 2: Infrastructure of the collaboration software

Table 4, shows some of the possible alternative solutions, which feature separation by categories.

Table 4: Comparison of the possible solutions

software name	price	multiple users in the same time	capacity	supported file formats	mobile access	technical knowledge	security
wiki	free	editing	without limit	/	available	minimal	weak
Google Docs or Google Apps	free	share open edit	5GB for storage	.doc,.docx .xls,.xlsx .ppt,.pptx .odt,.pdf ...	available	very low	password protected
Microsoft Skydrive	free	share open edit	7GB for storage	Microsoft Office, OneNote	available	very low	password protected
Face book group	free	editing	/	.doc,.docx jpeg,...	available	very low	strong
Teamwork hosted	2500eur os per year	comfortable enviroment	without limit	many	available	low	password protected

We will start the analysis with the commercial software. Their common feature is that they are of comfortable graphic design and provide a range of additional tools for communication and collaboration (for example, software support for the whiteboard). For this analysis, we chose Teamwork, as representative of medium expensive software. Teamwork is a proven, reliable and friendly web based project management solutions for handling work in any field. Teamwork is often chosen by universities as supporting application for project management courses. It is mainly a tool for collecting work data in real time, while the projects are running. It also provides several tools to estimate work to be done. This type of software would completely satisfy all the requirements of "collaboration software", previously exposed, and even provide greater functionality for convenient work of the employees.

Wiki pages have two very good features - unlimited capacity and minimal technical knowledge required for using the service; however three of the seven extracted features are not good enough. Multiple users cannot use the service at the same time, users enter data in a given environment, which means that the solution does not support multiple file formats and there is no data protection against unauthorized alteration, in this case it is only possible to restore the previous version, but this feature excludes the possibility of selective allocation of rights to specific users, which we have singled out as an important feature in consideration of general characteristics of "collaboration software".

The formation of groups on the social network Facebook is certainly a kind of solution, but it introduces the problem of socio-psychological nature in terms of its use, so it will not be specifically commented on here. SkyDrive and Google services are quite similar in their characteristics; the only difference is the capacity for data storage. SkyDrive is more preferable there. The good sides of both of these services are that they provide all basic functions that we have selected as important for "collaboration software", and that they are free. They do not give such comfortable graphical interface, nor additional features, but we must say they are satisfactory option for free services.

6. DISCUSSION OF THE SOLUTION

The school has approached the process of organizational changes comprehensively and with consideration of all relevant parameters. Of course, it was taken into account that, in our conditions, this is a pioneer attempt and that the solutions adopted would significantly influence needs to change the existing practices in our education process.

Generally, school's requirements are such that it is necessary to meet the terms of the following parameters:

1. The rate, since the school budget is very limited and buying software would certainly not have been identified as a priority
2. The possibility that multiple users work simultaneously on the same document, because this option saves time needed for meeting
3. Document capacity
4. Number of supported file formats, depending on the needs especially in the field of vocational subjects where number of current file formats can be rather big and demanding
5. The possibility to access documents and information by mobile devices, as the percentage of employees with those requirements increases
6. Technical knowledge required to use the software service is an important parameter because there are employees who have lower level of skills in the use of information technology, especially among the older members
7. Data security is important in terms of unauthorized access and permission of access to a specific set of information and documents.

The school was to assess which parameters are most important to it and make choices accordingly, being sure that any of the solutions would result in more or less higher level of communication than the present one, and thus increase the effectiveness of teams, including the sector. Normally, free software was considered first. Wiki pages were rejected because of the weak security, which is not acceptable for most of the files, and because the environment for file formats is not comfortable. The formation of groups on the social network Facebook was rejected because of the reasons of socio-psychological nature, previously mentioned. The choice was on Google services or Microsoft SkyDrive. Features of these two solutions, as previously mentioned, are very similar. Technical school Uzice chose the solution SkyDrive. The possibility of

integration with some of the Microsoft educational software later on and better help support determined the choice. The decision was made shortly before writing this paper, so the effects of the implementation can be the subject of another analysis.

However, the necessary requirements will be met by introducing SkyDrive based collaboration software. The possibilities that this software offers, are defined through the next several paths.

What does this collaboration software bring in relation to the previous solutions for the communication of the teams members? What does this collaboration software bring in relation to the previous solutions for monitoring and controlling the process of performing the tasks and aims done by team leaders? The team is working on a task, all are granted certain rights, which control the visibility of information and documents. Team leader establishes rights for the team members. The information is also placed on the "wall" of the document, and in accordance with the rules of conduct, co-workers are able to see it immediately and respond to it. If someone is a member of several teams, all relevant information will be shown on his/her wall. Another gain in relation to e-mail is that it is easy to track changes. Suppose that a team member wrote a document and put it on the portal of his/her team. All team members can look at it and possibly make amendments or changes. The new version, but also any old one, will still be available to everyone, and it will be known who changed it, when and what was changed. So if a team member wants to look at the document after a while, he/she will not be in a dilemma whether the electronic mail attachment, which he found is indeed the final version or at some point someone may have forgotten to send it to him. Team leader can monitor the level of performance of each team member. With this software that employees use at school or home, the problems numbered from 1 to 6 are overcome.

What does this collaboration software bring in relation to the existing solutions in monitoring and controlling the effectiveness of teams' work for the sector managers? Team managers and the sector manager may form a new communication group, which would work on similar principles as described above. The sector manager defines access rights.

What does this collaboration software bring in relation to the existing solutions in monitoring and controlling the processes that are ongoing in the school for the school director? The Director and the sector managers may make the highest hierarchy group in the collaboration software. Problems given in numbers from 7 to 9 will be moderated by these solutions.

7. CONCLUSION

The new organizational structure in the management system, strategically established and organized teams and set 'core values' for each employee have led to increased efficiency and productivity of the school in carrying out its activities. The implementation of software solutions aimed at optimizing the processes occurring within the teams and especially within the sectors will raise the accomplished levels of efficiency and productivity further more; at the same time the employee satisfaction will also be raised. The employees will be able to perform part of their obligations anytime and anywhere; they will be able to establish communication and cooperation with other team members in an easy and reliable way.

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