

## E-LEARNING FROM BUSINESS PROCESSES ASPECT E-OBRAZOVANJE S APEKTA POSLOVNIH PROCESA

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### *Abstract*

High quality education is a very important precondition of country's social-economic development. In that respect the e-learning becomes a trend in contemporary curriculum. The increased use of ICT and implementation of new pedagogic methods are just some characteristics of present-day educational methods. Contemporary educational methods, which imply e-learning programs as one of ICT usage results, enable students to acquire knowledge from a distant location with or without a mentor. The most remarkable features of e-learning are experience and problems solving sharing with other participants as well as on-line testing. This paper analyses relations between teachers and students activities during e-learning and e-learning process in order to constantly improve quality of the educational method on one side and the level of acquired knowledge on the other side. New hybrid educational organization, (classroom education and education in virtual surrounding) in which business processes in educational system are continuously subject to alterations due to better results achievement, is the answer to challenging market and society demands.

### *Sažetak*

Važan preduvjet društveno-ekonomskog razvoja svake zemlje je visoka kvaliteta obrazovanja. U tom kontekstu e-obrazovanje postaje trend u suvremenoj nastavi. Povećano korištenje ICT-a i primjena novih pedagoških metoda samo su neke od karakteristika današnjih nastavnih metoda. Suvremene metode obrazovanja, koje impliciraju e-obrazovne programe kao jedan od rezultata korištenja ICT-a u obrazovanju, omogućavaju učenicima stjecanje znanja s udaljene lokacije sa ili bez mentora. Najupečatljivije značajke e-učenja su dijeljenje iskustava i rješenja za probleme s ostalim sudionicima u e-nastavi, te on-line testiranje. U ovom radu analiziramo odnos aktivnosti nastavnika i učenika u postupku e-nastave i e-učenja u smislu neprekidnog poboljšanja kvalitete e-obrazovanja kao obrazovnog postupka s jedne strane i razine stečenog znanja s druge strane. Nova hibridna organizacija obrazovanja (učionička nastava i nastava u virtualnom okruženju), u kojoj su poslovni procesi u sustavu obrazovanja kontinuirano podložni promjenama s ciljem postizanja što boljih rezultata, predstavlja odgovor na sve izazovnije zahtjeve tržišta i društva općenito.

### **Introduction**

The best practice in case of e-learning connects the advantages of classroom education and education in a virtual environment resulting in the use of hybrid education model. E-learning covers wide range of educational materials that could be delivered on CD-ROM or DVD, via local network (LAN), or Internet. This includes usage of Computer-Based Training (CBT); web application - Web-Based Training (WBT), software implementation as user backup, online learning and online handbooks in education /1/.

Aldrich Clark defines e-learning as a combination of processes, contents and infrastructure in usage of computer and networks towards learning process improvement, including management and delivery /2/. Main features of e-learning are long-term content availability, unrestricted access to the content, costs and time reduction of education. Students have at their disposal classical and virtual classrooms, web seminars, simulations, CBT/WBT (*Computer based training/Web based training*), audio and video recording, user community cooperation, documents, video-conferences and data transfer. The high-quality e-learning development implies, besides good strategy, process quality analysis,

design, realization, evaluation and a continuous improvement of e-learning system.

One of the major research fields in e-learning is identification and quantification of various benchmarking quality tests within the evaluation framework of successful implementation of this educational form. According to Jon Siegel business process is defined as a related cluster of activities and decisions which are performed in order to achieve measurable objectives. The process consumes time and transforms incoming resources into specific deliverables or services which are important for the consumer /3/.

The aim of this paper is to examine the impact of business processes organization on quality improvement, education efficiency and service improvement through e-learning. The research is based on the data collected from the "EU IT educational pilot project", conducted by the firm King ICT in Kosovo. It was a part of the project related in supporting the introduction of teacher training in ICT technology usage in education and training process. Linking of all the participants in the educational process at local, regional and national levels is essential for joining the European educational network.

The efficient ICT education via virtual network connects all users and institutions. The teachers from pilot schools participated in the elaboration of e-content adjusted to the real educational curricula in the educational system. Teachers and students participating in the pilot project gave positive feedback on e-content and the role of ICT in the teaching process.

The open source solution DSpace was chosen among available software tools. This tool was developed at MIT-u (Massachusetts Institute of Technology), USA, and is available for educational institutions for upload, sharing and reuse of the developed learning contents according to subjects. The e-tests are used as one of e-examination methods for knowledge testing. The set of activities whereby digital technologies are used in knowledge and skills testing can be viewed as business processes in the e-testing working cycle. Such activities include design and verification, computer or teacher evaluation, online tools, entire process of information feedback, storage and information transfer linked to verification. The purpose of e-evaluation is to enable automatic tests correction and to support various ways of test implementation along with providing feedback on test results /4/. The paper encompasses the explana-

tion of methodology including pattern and polls description, while its main part deals with the results covering: business processes relationship within e-learning and classic teaching, subjective evaluation by students on the acquired knowledge during e-learning and preparedness for test writing, as well as the impact of business processes reorganization during e-education and online test results.

The hypothesis is that efficient business process management in lecture organization contributes to the improvement of the quality of classes and participation in them.

### **Methodology of the Research of the Impact of the Business Processes Improvement on the Learning Results**

Based on the EU-IT pilot project in the field of education, recommendations for technological and legal adjustments were determined that should enable broad usage of ICT in schools in Kosovo and introduction of e-learning as new teaching practice. Teachers have chosen 14 multimedia lessons, taking into consideration elementary and high schools curriculum for five subjects: mathematics, physics, biology, chemistry and English language. The research in this paper used the data obtained within the EU-IT pilot project in the field of education, according to the report from 2012 /5/. Combined methodology, i.e. both quality and quantity methodology were used in this research. The research was conducted on the sample of 28 pilot institutions from urban and rural areas of Kosovo. The polls comprised 28 schools (elementary and high schools), i.e. 125 teachers and 3800 students. The data analysis in this paper was used solely for research purposes and was not part of the project. The teachers and students evaluated their engagement within the educational process in case of e-learning as well as in classical education. Thereby, the number of activities, their demands and time cost were taken into consideration. All comprised activities were considered as business processes and were assessed according to Likert scale. The Pearson correlation was used in the relations analysis:

E-learning business processes and classical education business processes,  
Subjective estimation of acquired knowledge during e-learning and preparedness for online test writing,

Business processes reorganization during e-learning and online tests results.

The set hypotheses for business processes correlation between e-learning and classical education are as follows:

H0: There is no strong linkage between these two business processes;

H1: There is strong linkage between these two business processes.

Pearson's coefficient  $r$  is obtained using expression (1), where  $x$  is estimation of business processes improvement during e-classes,  $y$  is estimation of business processes improvement during classical classes,  $N$  is number of schools,  $\bar{x}$  is mean value of  $x$ ,  $\bar{y}$  is mean value of  $y$ .

$$(1) \quad r = \frac{\sum xy - N\bar{x}\bar{y}}{\sqrt{(\sum x^2 - N\bar{x}^2)(\sum y^2 - N\bar{y}^2)}}$$

The hypotheses for correlation between subjective estimation of acquired knowledge during e-learning and preparedness for test writing areas are as follows:

H0: There is strong linkage between subjective estimation of acquired knowledge during e-learning and test writing preparedness;

H1: There is no strong linkage between subjective estimation of acquired knowledge during e-learning and preparedness for test writing.

Pearson's coefficient  $r$  is obtained using expression (1), where  $x$  is student's subjective feeling that they have learned something important during e-classes,  $y$  is student's test writing preparedness after e-classes,  $N$  is number of students,  $\bar{x}$  is mean value of  $x$ ,  $\bar{y}$  is mean value of  $y$ .

The hypotheses for correlation between business processes reorganization during e-learning and online test results are as follows:

H0: There is strong linkage between business processes reorganization during e-learning and online test results;

H1: There is no strong linkage between business processes reorganization during e-learning and online test results.

Pearson's coefficient  $r$  is obtained using expression (1), where  $x$  is business processes improvement estimation during e-classes,  $y$  is online test result,  $N$  is number of schools,  $\bar{x}$  is mean value of  $x$ ,  $\bar{y}$  is mean value of  $y$ .

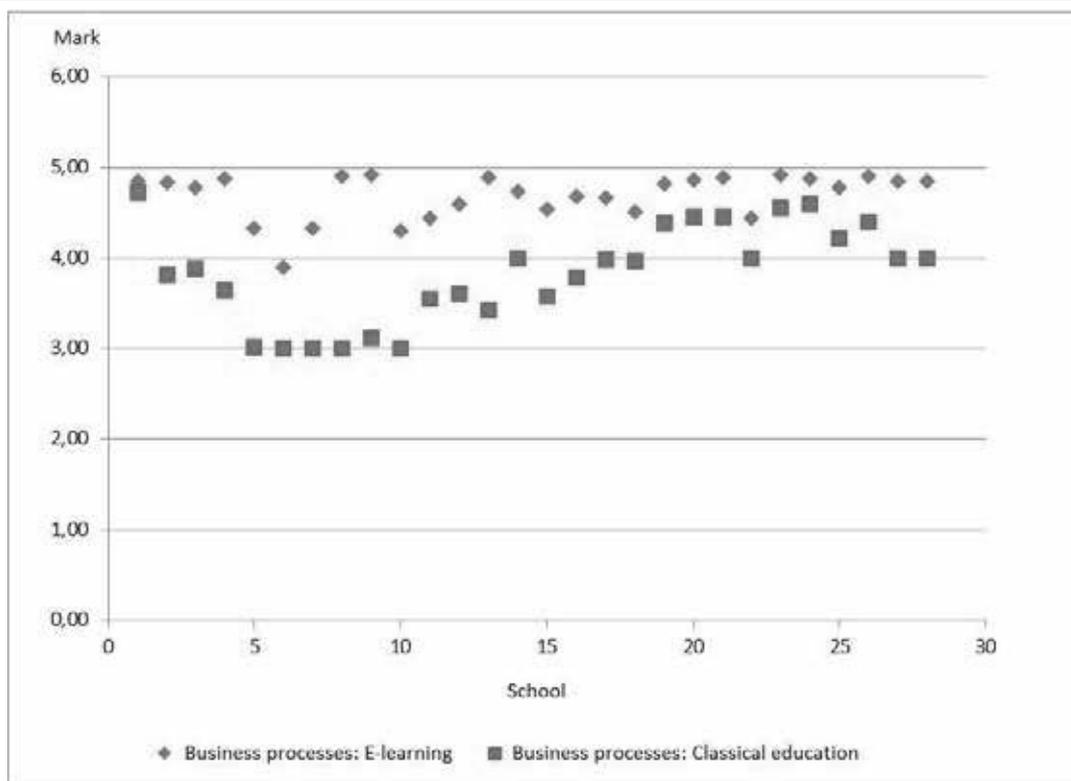
The results of the quantitative analysis are supplemented with the results of qualitative analysis. The survey and interviews were used in order to get information from students and teachers on lectures, methods, personal satisfaction, and business processes improvement suggestions.

### The Results Analysis Based on the Data Obtained in the Research of the Impact of Business Processes Improvement on Learning Results

Correlation between business processes referring to e-learning and business processes referring to classical education is positive but low ( $r=0.58$ ), meaning that activities related to e-learning could be completed without close connection to business processes linked to classical education (Figure 1). Pearson's correlation coefficient ( $r=0.58$ ) indicates that business processes within e-learning explain 34% variance from business processes in classical type of education.

We could confirm the relevance of the hypothesis that there is no strong linkage between business processes in e-learning and classical education.

In such environment the e-learning could be implemented independently as well as in combination with classical education /6/.



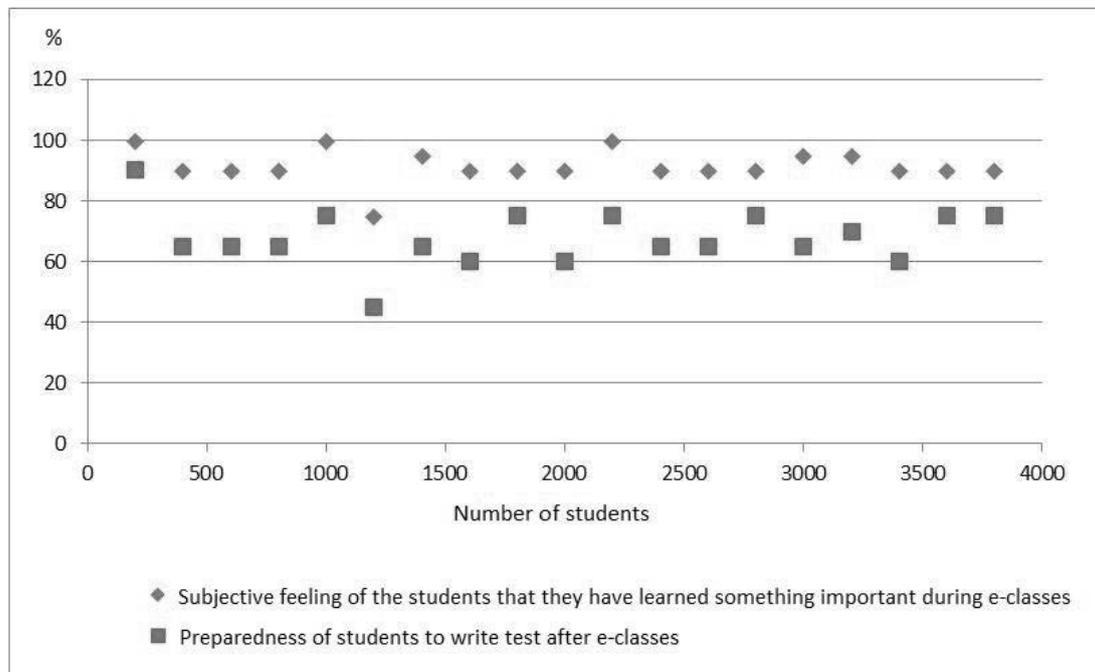
**Figure 1.** Diagram of business processes dispersion within e-learning and classical education

In the descriptive part of the survey, teachers emphasized procedures of preparation and planning prior the teaching, new and additional teaching material analysis, analysis of teaching materials for fields that might be difficult for students, and activities related to easy adjustment from classical way of learning to new methods. On the other hand, the students expressed satisfaction with new learning methods regarding dynamics, attractiveness, simplicity and ease in acquiring new knowledge. The change of teaching method resulted in greater motivation on both sides.

The teachers' aspect of e-learning business processes refer to jobs related to technology and multimedia, pedagogy, educational design, communication and cooperation, evaluation and feedback.

Business processes correlation analysis within the curricula, both in classical and e-learning, provides a background for professional and personal improvement of teachers' competences to the level required for successful implementation of e-learning.

From the students' aspects, business processes in virtual environment comprise activities related to web portals, forums and social networks. However, besides the establishment of a virtual community, there are live processes, "face to face" activities, which could be organized in parallel and serve the same purpose of educational community development or are even broader. Thus, for example, annual conferences and workshops could be organized in order to exchange experiences and acquired knowledge.



**Figure 2.** Dispersion diagram of students' attitude on acquired knowledge in e-learning and knowledge testing preparedness

High Pearson's correlation coefficient ( $r=0.74$ ) between students' personal perception on teaching material comprehension explained by new methods and online testing preparedness, indicates the efficiency of e-learning from the subjective aspect of students (Fig. 2). Students' personal perception variability of the importance of the studied teaching material with 54 % of share explains testing preparedness variability as the strongest single impact yet leaving enough space to other indicators. The correlation of students' subjective feeling on learned material and testing preparedness are significant indicating students' motivation to accept activities focused on e-learning. The hypothesis is that there is strong linkage between the subjective assessment of acquired knowledge during e-learning and test writing preparedness. The majority of students did not have any problems in following e-classes and learning after the classes (83%), and they expressed interest in similar trainings in the future. They would also like to extend such type of classes on other subjects (88%). Strong positive correlation ( $r=0.74$ ) between teachers' assessment of business processes improvement and online tests results (Figure 3) indicates the need for continuous changes and efficient management of

the existing business processes, in terms of possible abolishment of unnecessary business processes and implementation of the new ones due to application of new technologies /7/. The business processes improvement variability with the share of 55% in test results is significant, but indicates that there are other factors affecting the test results. This means that business processes improvement affects all other factors that could affect test results. Therefore, the initial hypothesis that there is strong linkage between business processes reorganization in the course of e-learning and online tests results has been confirmed. Furthermore, the analysis by means of correlation quotient is followed by the quality analysis of the opinion of the majority of teachers pointing out that in spite of all ICT's positive aspects in education, the development of active communication between teachers and students as well as of students among themselves should continue. If there is lack of efficient business processes management incorporating both, technology and classical lecturing processes, the advantages of each of those teaching methods would be suppressed instead of being integrated into an optimal combination leading towards excellent educational results.

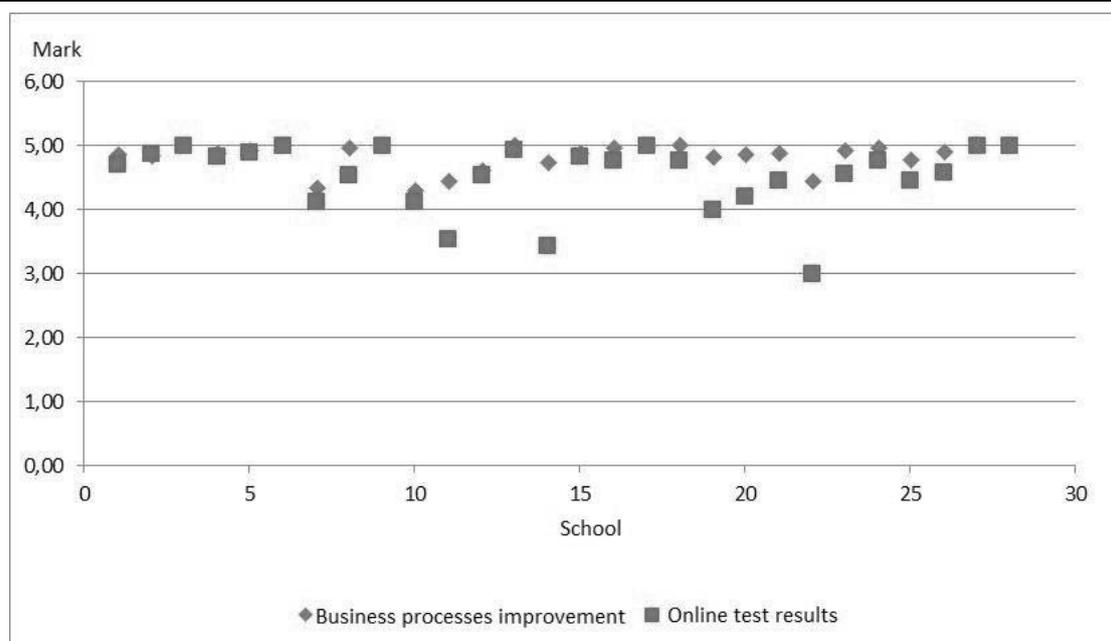


Figure 3. Dispersion diagram of business processes improvement during e-learning and of test results

One multimedia lecture unit could last from 1-3 classes depending on business process organization within that unit, students' preparedness or on the complexity of the selected multimedia unit. Such business processes analysis helps teachers in decision making when choosing the appropriate preparation for the introduction into a teaching unit (e.g. by the use of power point presentation) in order to explain the context of the lecture and show how to increase the understanding of the lecture contents by the students. Teacher adjusts business processes according to the functionality of each multimedia unit and the demands of the accompanying exercises. Then he relates the multimedia unit to the previous lecture themes and the previous students' knowledge with the aim to fulfill educational expectations of the new theme. Among other things, teacher makes specialized classroom usage schedule for multimedia purpose. He/she also checks conditions for the next multimedia unit and exercises according to the estimated students' knowledge and skills. Teachers use training units from Mentor Learning Management System and Power Point presentations prepared in advance and explain online exercises and tests usage. This process implies preparations of a certain format i.e. MS Power Point presentation or the usage of Mentor Learning Management System (LMS). Preparation of additional information sources enables better understanding of new educational material. This new teaching method could be related to classical teaching methods and models already being used in classrooms (e.g. plastic DNA models, hu-

man body models or similar simulations and models) and could be used simultaneously as well to explain one term in two different ways.

#### Advantages of the New Technologies Introduction in Educational Process

Thinking about linkage and mutual correlation of business processes during the educational cycle, contributes to better understanding of the role new technologies play in education. Introducing the ICT in schools will not solve the problems by itself or bring a huge progress overnight. Activities organization affects class quality and optimal role of technology in knowledge acquisition. Thus, for example, instead of marking the written tests, teacher gets insight in online test results in a shorter period of time. The course of the lecture is not focused exclusively on the lecturing teacher anymore, but there are possibilities to use combination of e-contents or to fully rely on the presentation of the teaching unit by means of e-learning. The success of e-learning greatly depends on corresponding business processes. The correlations resulting from this research provide teachers with a foundation for activity planning and process coordination among the teachers, between teachers and students and among students. However, business processes are subject to continuous changes and efficient business process management is necessary. They require a constant control and a timely response to possible impacts of new situations. Continuous educational business processes quality monitoring and learning results provide possibili-

ties for new learning services development and interactive educational programs. There is opportunity to create systems that would enable incorporation into learning and self-learning processes, systems for educational services usage via computers, software tools for educational contents presentation, computer-supported research, usage of network and grid technologies, virtual schools and campuses, data bases, e-learning services, etc. /9/. The teacher can use different kind of Web services in order to communicate with students in the tutorial process, like Instant Messenger, Skype, Facebook, online forum and Google, for communication improvement within the classroom and among students.

Teachers can use video technology in lecture preparation along with live meeting and Web casting services. The use of video materials in education and learning helps teachers make their lectures more interesting, provide students with a different approach to the topic, share their lectures with other teachers, reuse already prepared materials as well as improve their own educational skills. E-learning improves educational quality and sets standards in education, contributes creation of a modern education system in an innovative way and supports cooperative and creative learning and critical thinking. E-learning also provides access to all levels of education (elementary, high, university and lifelong education) for disabled students, low social rank students, students from rural or geographically isolated areas.

E-learning provides faster and easier educational process development according to society needs and it could as well be focused on the employment growth.

## Conclusions

Relative independence of business processes within e-learning and business processes in classical education gives freedom of choosing activities that would be mutually related and supplemented thus creating a foundation for students' and teachers' innovative engagement.

Students' satisfaction with acquired knowledge during e-learning and their preparedness for immediate testing is a positive background for introduction of new improvements in educational process. Given the fact that business processes reorganization in the course of e-learning affects the results of knowledge testing, it could be assumed that

business processes improvement would imply better results in the course of testing. This research confirms the initial hypothesis that efficient business processes management in education contributes to the improvement of teaching and participation in the classes. Students understand better new learning materials and can immediately notify teachers in case of misunderstanding and actively participate and express their opinion on new subject. Business processes management within lecture organization by using e-learning enables teachers to keep students' attention, make them interested in their peers' opinion, and encourage students' imagination to make them more active and fully concentrated on the lecture. Business processes organization directed towards team work promotion as a very useful educational strategy can be used in the course of lectures when applying multimedia contents, when students explore or present certain topics, independently of their teachers. Business processes within e-learning are reflected through students' communication on the acquired knowledge on Web-pages or blogs, by sending e-mails, creating Power Point Presentations and presenting team work results to their colleagues. Efficient business process management in the educational cycle enables usage of ICT be more than ordinary technology, i.e. students enjoy lectures more, increase their competences and skills in teamwork, help each other in acquiring new knowledge, broaden their interests in certain fields, show others their creativity and knowledge, find better and more appropriate learning methods and take a more active part in classes. Technological progress continuously creates new possibilities for life quality improvement, productivity and new scopes of application in education, business and public sectors, and society in general. Integration of new learning forms, and ICT integration in particular, plays a key role in the development of educational system. The ICT implementation in education aims at using the information and communication technology to create, distribute and disseminate data, information, teaching and knowledge for the improvement of the learning process quality. The initiative of e-learning integration into educational system also includes: raising awareness of e-learning advantages, methodical development of human resources and infrastructure for e-learning implementation, e-contents development according to defined standards, quality assurance in e-learning implementation, inclusion of e-learning in formal education and curriculum /10/.

Rethinking of business processes reorganization in e-learning is set within the context of efficient e-learning integration into the education system of high quality standards for knowledge based on the society that would enable socio-economic development and increase possibilities for lifelong learning.

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