

Integrated e-Education System Design

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The implementation of ICT in to education is a complex task depending on the accessibility of technology, know-how of study materials design, systems of monitoring, evaluation, the legal and regulatory framework and other issues. Regarding these facts; e-education is not exploited broadly and effectively enough in the university education today. One of the reasons is lack of the methodology for solving such a complex problem. There is a need for the systematically oriented approach. This article presents such methodology and its concrete application in e-education at the University of Zilina. This methodology is created on the basis of innovation approaches.

Keywords e-education; ICT implementation; methodology of e-learning

1. Introduce

Innovations are generally realized by means of new solutions. The expression „innovation“ means an application of something new, using of what the old approach (which has been used up to now) has been replaced by the new innovative solutions. These solutions are interfering with the existing activities and processes. They enable new solutions and possibilities, which were not used up to now. New activities and processes are facilitated by new information & communication services. Phase in which are new ICT implemented is the most complicated one. It is because in addition to technological and economical aspects, the solutions have also to meet socio-cultural aspects that are often underestimated. There are, of course, other dimensions that have to be taken into account in every development phase. Apart from technological and implementation aspects, it is also a general economical situation, legal aspects enabling free market and its development, as well as the attitude of a society towards the given innovations. All above-mentioned aspects are relevant. They represent the challenge to be solved and overcome. To create this last phase of using information & communication technology the systematic approach to the solution is needed. Traditional universities stand certainly in the forefront of the change that will require consistent preparation and system oriented solutions of e-education service implementation. This system oriented approach to the implementation of ICT in to education at universities, in pre-graduate and life-time education is required for more effective development of e-education.

2. Environment analysis

As it has become clear today, education is global in the same way as economy. This is due to faster knowledge spreading, as well as usage of new technologies. As any external influence to the system in equilibrium, the impact of foreign educational institutions to the educational market in Slovakia will bring new challenges but new risks too. As has been mentioned above, e-education implementation is long-term process. Even if the final goal is to offer some courses worldwide, we start at the Slovak universities to apply e-education at the Slovak market mainly. To create e-education system efficiently, it is advantageous to negotiate between universities with the similar courses to establish a common core of curricula. In this way the number of students using the same education tools will be increased and the expected investments of effort and money will be efficient. It is not easy to accept this concept of common core for universities. We have a specific situation in Slovakia. Based on new Act on Higher educa-

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tion the number of study branches should be reduced. Big discussion about it is going on. It will be good, if the subject of e-education is included in this discussion. The individual approach cannot be successful enough. In accordance to that it can be assumed, that larger step towards e-education may be done only by the mutual co-operation of universities.

It is not possible to implement e-education simultaneously at all universities, and pilot projects are running on several universities at the present time. However it will be necessary to have some coordination to identify barriers, and to propose how to overcome them, regardless their source. This may concern methodology, human resources and infrastructure.

3. Implementation of integrated e-education system at the university of Zilina

We have used the general methodology to the implementation of e-education service. Some experiences obtained during this experiment are described below.

3.1 Specification and Description of e-Education

As a starting point at the University of Zilina the following documents were used:

1. *eEurope+*, Action Plan prepared by the Council and the European Commission,
2. Documents of Higher Education.

The Action Plan for *eEurope* activities brings the specific e-educational actions together in complementary e-education initiatives. E-education encompasses *eEurope* targets in an educationally oriented framework and addresses the request to adapt European education and training systems to the knowledge society.

Base frameworks for development of higher education in the new educational environment are defined in many documents from meetings of university representatives and ministers responsible for education in Europe too. Such documents as Magna Charta Universitatum (1988), Bologna declaration (1999), Salamanca convention (2001), Prague summit of ministers (2001), etc. give key views about the future development of the university education.

3.2 Forecasting and Planning of e-Education

The ideas of the above mentioned documents lead us to the consideration that the implementation of e-education has to be one of the main items of the global university strategy. The implementation of e-education leads staff to new roles and unknown activities. To open up these new roles to university staff is very important and explains all the reasons why this strategic plan has been developed.

Therefore our university management has developed a strategic plan, and offered it for general discussion.

3.3 Technology of e-Education Specification

Comparing the e-education with "stone universities", we can see a new business model of education. There are new players in e-education, and the roles of the players are changed. The following table 1 shows the new structure of the players in e-education.

Table 1 e-Education Value Chain.

e-Education players	New roles
Students	Distance learning Using worldwide information electronic sources
Producers	Design and implementation of e-education Allocation of budget covering higher starting costs Diversification of budget sources
Organizers	Taking more responsibility for the content (course coordination) Generating of multimedia courses according to given scenarios Creation of a new education management system
Teachers	Finding a new model of student tasks Distance helping for students Knowledge of most relevant electronic information source Student coaching
Provider of network infrastructure and network services	Building up and operation of network infrastructure including servers Performance/operation of network services at required quality of service
e-Learning technology suppliers	End equipment Application software Authoring systems for multimedia courses creation
Provider of courseware server	Building and operation of courseware servers Data security Courseware maintenance
Providers of multimedia courses	Building and operation of authoring systems Cooperation with content creators and scenarios creators Production of multimedia courses
e-Learning service management	Service operation and maintenance Students authorization and authentication Billing

This change of players and roles will bring change to the university staff structure; establishing new positions and the changes in the teaching methodology. Each position in the new value chain has to be described by activities and interfaces. The implementation of the new roles into the existing organisation structure creates several problems: the cooperation is running today within established groups, which is not effective in a new structure, people obtain new tasks without discarding the old ones, etc. On the other hand, the university transformation has to be realized. The new academic law defines new university competencies for a new business model. The university has prepared a new status in which new tasks given by e-education are also reflected.

3.4 Process Analysis

When information & communication technology is used in the existing educational process, it does not bring such great innovation as in a new solution of educational process. It only replaces former manually or mechanically done activities that improve the quality and efficiency of the educational processes. To bring new solutions and innovations is necessary to rebuild the existing educational process. For this purpose a business process reengineering methodology can be used. Such approach is described, for example, in [1]. The educational process is important from the teaching and learning point of view, namely in the sub processes:

- of teaching
- of study materials preparing
- examination.

We have analysed the educational process at our university using structural analysis based on flow charts for different levels of details too. For each process a flow chart has been designed and the processes have been described in detail. The critical analysis of existing educational process has uncovered many problems concerning the use of ICT

3.5 New process design or process redesign

To bring new solutions and innovations it is necessary to rebuild the existing educational process. For this purpose a business process improvement methodology can be used. The inputs to the new processes design are:

- the critical analysis of the existing educational processes
- the understanding of new information and communication technology possibilities.

The new process creation is possible based on the application of a reengineering method, problem analysis and the formation of a problem hierarchy together with the knowledge of opportunities that information & communication technologies provide.

The procedure of new processes design includes:

- the definition of crucial processes parameters
- the implementation of new information & communication technologies impact and its evaluation
- the alternative solutions design
- the solutions evaluation, and selection of the most appropriate one

In [2] the solution of new process creation and realisation is presented.

3.6 Preparation feasibility conditions

However progressive e-education might be, there is always a possibility some teachers will not accept it. G. C. Gourales Gorales (2000) says: "Changing the manner in which interaction occurs calls for redesigning not only of the formal structures within the company, but also in the informal patterns of interaction between individuals and processes", and as we see, between employers and management too.

A new way of thinking is required between all players in the new value chain in e-education. They have to change their habits, and thinking about how to transfer their knowledge and experience from the traditional education and from ICT into e-education. If they are not familiar with the principles of e-education, it is very natural that they will try to prevent the changes. Such teachers may want to prevent the changes because they don't understand change or they do not know the origins of this change or they don't make changes. If all the players see their roles in the new value chain and accept new possibilities, then there is the chance they will actively participate. The transformation principles are possible to create. The reengineering method [3] describes the new process creation by means of transformation principles.

3.7 User requirements specification

The users of the e-education technical system are teachers, students and administrative staff at the university. The priorities and points of view of students, teachers and administrative staff are different, and it seems to be a never-ending story to find a consensus.

Slovak universities have carry out the project „Use of IKT and new generation networks platform in the education“. It started in the year 2003 and ends in June 2006. We have brought our approach to the creation of the new learning and teaching process in the university to this project.

To confirm whether our solution was helpful the Technology foresight methodology was used. According to this methodology the first step was SWOT analysis of e-education. From the SWOT analysis we discover the problem areas, which will be solved by means of the expert's questionnaire.

Four problem areas were specified:

- the teaching and learning process
- the e-study material development process
- the management of the education process
- the information and communication structure realisation.

268 teachers and 249 students from the various Slovak universities completed the questionnaire. After the questionnaire research there was the brainstorming of experts put into practice.

3.8 Technical structure design

System analysis and design was used as the methodology of the e-education system creation. Because of non-professional solution the suggested Integrated system e-education consist of from five technical separated systems according to the sub-processes of the learning and teaching process: System of summary of the subject information; Learning Management system; System for exam booking; System students grades recording; Course evaluation system.

3.9 Pilot project realisation

The suggested e-education system has been tested at the University of Zilina. It is accessible on <http://vzdelavanie.utc.sk>.

Conclusion

Information & communication technologies bring new tools to education. To highlight their impact comparing with non-electronic tools, term e-education is used nowadays. This term will probably disappear when these tools will be such as natural part of education technology as for example books are currently. In the meantime, many universities have implemented these tools to their education. We can see many pilot projects at universities, but from our perspective, blank experiment cannot be used as a method for a mass implementation. Methodology of e-education implementation has to be developed. We propose basis of such methodology based on three-partial systems and our experience with its application at our university is described in the paper. We have recognised that using this methodology gave us more certainty in the complex task of the e-education implementation. We have also learned that e-education implementation is not a single-shot task, but it continues in spirals.

References

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