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AN EXAMPLE OF PROCESS INTEGRATION IN E-EDUCATION SYSTEM PROCES INTEGRÁCIE V ELEKTRONICKOM VZDELÁVACOM SYSTÉME

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This paper considers integration of educational processes and appropriate software applications through organization of studies, realization of educational and research processes and content management. Information technology development enables more efficient teaching through orientation to knowledge transfer instead of presentation and more efficient study using students' services subsystem and LMS. The paper presents an example of implementing this concept through the realization of faculty intranet and using LMS. An example of e-education process analysis and software components integration at the Faculty of Organizational Sciences, University of Belgrade, is given, too.

Key words: e-education, learning management systems, content management systems, Internet technologie

The distance education can not be examined separately from the information-communication technologies, multimedia and Internet. This correlation can be noticed in the teaching preparation processes, presentation of the teaching material, communication and the learning processes. The application of information technologies depends on a type of content, organization and strategy of the education process. This paper deals with the analysis of the processes included in e-education and integration of software components for their realization.

E-EDUCATION PROCESSES

The distance education is a complex system that includes distance teaching and learning, which are separated in time and space, as well as teaching materials that can be in various forms, individual or group learning process, tutorial and interactive work (Keegen, 1996).

Developing education materials

Education materials are the most important element of the distance education. When we talk about classical education, they represent only backup to the teaching process in which the teacher has the main role. As far as the distance education is concerned, education materials represent the main source of new knowledge and skills. They are also the controllers of the teaching process course because they lead all students through the instruction process and direct them to the desired goal. Their role is very complex and the influence they have on the quality and result of the distance education is crucial.

The process of preparing and developing e-materials for the needs of distance education is a four-phase cycle: analysis, design, development and evaluation (Figure 1.) (Discenza et al., 2002).

For the sake of standardization of development of education materials it is recommended that suitable automated didactic forms (templates) should be used. Use of templates provides the required level of coordination of different teaching approaches. If there are quality contrived templates for design of education materials, the teachers can completely dedicate to

the creation of teaching content of the course and its fitting into the forms and structure determined by templates.

Preparation of teaching content

In the process of transition from the traditional textbook to e-textbook, as well as during the design of electronic materials, the following characteristics of electronic teaching and learning should be taken into consideration:

- Lectures at the agreed time,
- Completely individualized studying ,
- Studying at arbitrary time,
- Studying at any place,
- Studying with the aid of an appropriate device.

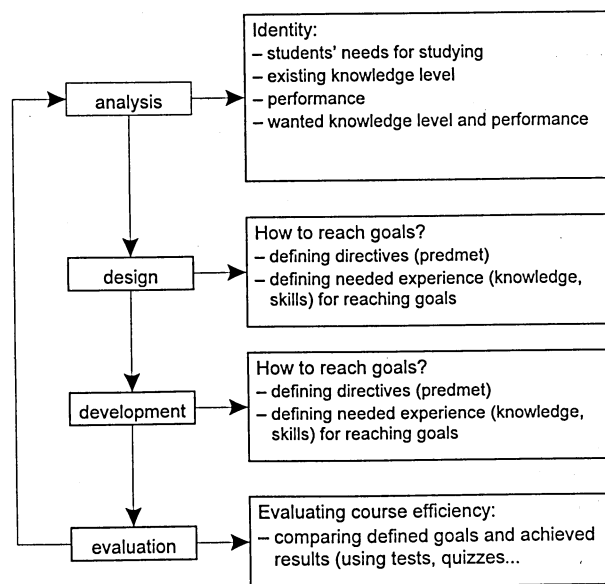


Figure 1 Process of preparing and developing e-materials

As far as the expenses, technology and necessary resources are concerned, it can be concluded that the main characteristics of the distance education, in regard to the classical education, are as follows:

- Lower expenses of the education realization.
- Higher expenses of textbook development.
- Faster learning.
- New required knowledge and skills.
- Developed required backup section.
- Cheaper hardware and software.
- No travels and absence from work.
- Possibility of complex using knowledge.

Conversion of traditional into electronic textbook is carried out gradually, expanding the level of application of e-materials in each iteration, as well as the interaction between the participants in the education process: Level 1. Replication of materials without interactivity. Level 2. Audio and video support. Level 3. Interaction through evaluation of answers to asked questions. Level 4. Interaction through evaluation of the learned, limitation of further access until the task is completed, making decisions in the simulation of real situation. Level 5. Complete interaction and guided learning through support in doing concrete tasks – simulations, scenarios, practical exercises, evaluation of solutions and decisions.

Communication in e-education

The ways of communication between participants in the e-education process are given in Figure 2.

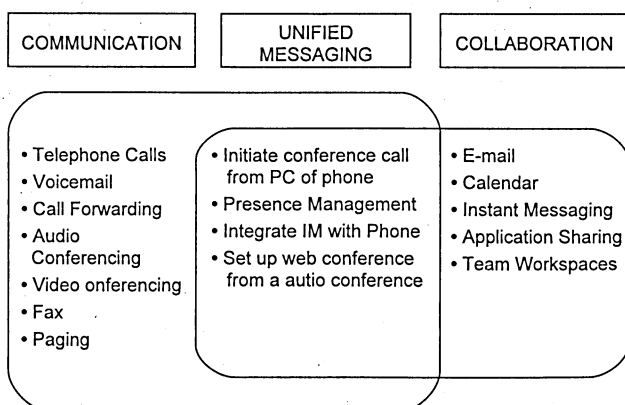


Figure 2 Communication in the e-education process

Communication in the e-education process can be realized by the use of various synchronous or asynchronous interaction forms, such as e-mail, network news, forums, chats, electronic board, teleconference, etc. Exchange of messages encompasses various types of communication, such as mail, voice mail, e-mail, fax, etc. Efficient message exchange system is necessary for good communication and collaboration between the participants in the distance education process. Collaboration in distance education implies interaction not only between the teacher and the students, but also between the students themselves. Although the students can be geographically dislocated, studying in groups and through mutual interaction most often leads to better results.

LEARNING MANAGEMENT SYSTEMS

Learning Management Systems (LMS) enable teaching material management, observation of students, evaluation, etc. These systems are oriented towards creation of and composing various teaching objects (teaching materials). LMS offer the possibility of different forms of collaboration during the learning process. One of the basic tendencies of these systems is to provide a different use of the teaching objects, which can be ensured by preparing teaching materials, using the tools which support SCORM (Sharable Content Object Reference Model) standard.

Moodle

Moodle (Modular Object Oriented Developmental Learning Environment) is an *open-source* learning management system supporting SCORM standard. It is used by universities, schools and individual instructors, first of all, for the sake of the advancement of education by means of Web technologies (www.moodle.org). Installed Course Management System – CMS provides tools for professors who use them to create the web sites in courses, as well as the access control for students. Basic tools are: uploading and exchange of materials, forums, chat, online quizzes and tests, wiki, workshops, collecting and checking tasks allotted, recording marks – online.

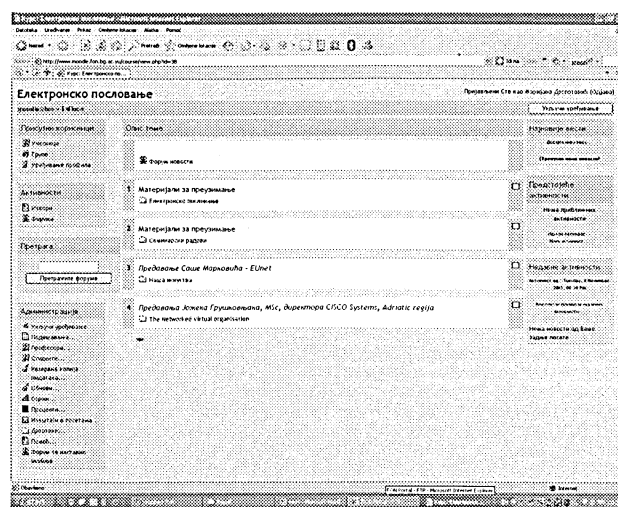


Figure 3 Moodle LMS screenshot

The key processes for the functioning of Moodle LMS are as follows:

- administration of users and user groups,
- assignment of roles and activities,
- creation of courses and teaching groups,
- addition of contents (text and web pages, links, audio-video recordings),
- defining the activities for teaching groups by teaching units,
- communication between participants in the education process,
- observation and evaluation of work of students

Within the scope of the system of post-graduate studies at the Faculty of Organizational Sciences (FON), Moodle is used as the system for the realization of distance education.

Methodological solutions to the development of didactic systems

Methodological solutions to the development of didactic systems (based on an ADDIE model: Analysis, Design, Development, Implementation and Evaluation, within the framework of which the modern education for performing concrete tasks is carried out) are brought into accord with: modern access to synthesis of complex dynamic systems; „e-learning“ technology, as well as pedagogical and the adult education attitudes towards learning (acquisition of knowledge, skills and habits) and didactic rules for the organization and realization of education. Modern education can be realized in the didactic system that functions in the strong interaction with its environment (social, i.e. business systems) and whose structure is made of participants in the teaching process; education technology, and education contents (Moore and William, 2003).

Browsing knowledge

In the electronic education process, knowledge is presented in various sources and forms. Content management systems make it possible for users to set, find and use various contents in quick and easy way.

Digital libraries are distinguished as important knowledge sources. They represent a collection of documents, information and other artefacts, some of which can be presented in the written form. The aim of the digital libraries is to systematically improve methods for collecting, keeping and organization of information in digital form, as well as to provide quick and easy access to this information.

PORTAL FOR E-EDUCATION AS AN INTEGRATION FRAMEWORK

Success of distance education depends on the application of LMS, tools for the creation and distribution of contents and integration with the existing information systems in the educational institution. Following the introduction of LMS „Moodle“ to postgraduate studies at the Faculty of Organizational Sciences, the real need appeared for its integration with the group of Internet services in the computer network of the faculty and the existing IS of postgraduate studies. The integration of the components of e-education system and business information system within the framework of e-education portal is shown in Figure 4.

People integration – students, teachers and other participants in the education process can access system or communicate between themselves from any location. Information integration – the system enables collecting various, non-structured data, whereas the users can access the structured information through portal. This is achieved by using the „content management“ service. Also, the users can obtain various kinds of reports, analyses, data interpretation, etc. Process integration – existing processes in the computer network of the faculty are integrated with the distance education system using XML Web service. Application Platform – applications of the e-education system are realized by the use of various technologies so that the integration must be carried out at the application level as well.

Authorization and identification in e-education portal

Successful use of electronic education requires online equivalent to the infrastructure that is used for management and

administration of classical education. Such infrastructure requires the following components (Charalambos and Glass, 2002):

- Registration Process: the unique identification number must be created for each user (i.e. for all students, teachers and education administrators). Thanks to this, all activities inside the system can be filed and observed.
- Security Control Mechanism: the users should have access to the functions and resources that respond to their roles in the education process. In this way, the control of activities is provided.
- Enrolment Process: students who enroll must be able to access the course.
- Education Supporting Environment: students should be able to communicate between themselves, take part in the classes and put questions to their instructors.
- Testing and assesment: it is necessary to provide appropriate mechanisms for measuring results.
- Teaching program and course management database.
- Education Process Observation: it is necessary to observe all students' activities related to education and to enable obtaining various reports. The system should contain the education management database.

The basic integration problem in heterogenous environment like this is finding a unique method for identification and authorization of the system users, professors, students, and administrative workers. This group of tasks is done by means of LDAP protocol (Lightweight Directory Access Protocol).

The first integration level is realized in such a way that all components of the Internet service of the faculty, information system and LMS Moodle must carry out authentication and authorization of all their users and processes on the centralized LDAP server of the faculty. The existing Internet services at the Faculty of Organization Sciences which use an LDAP server for

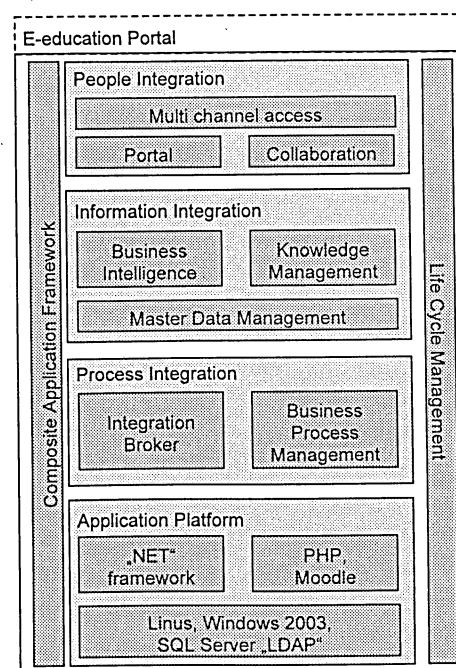


Figure 4 E-education Portal as an integration framework

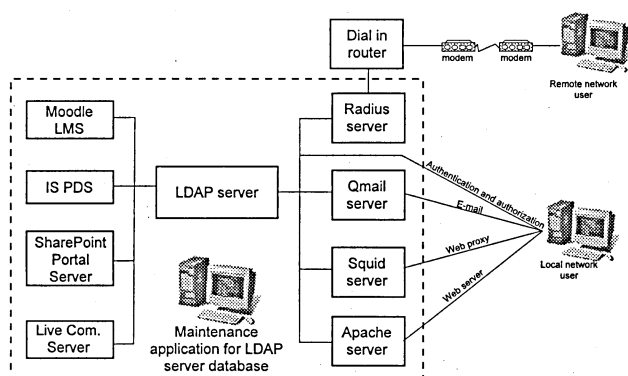


Figure 5 LDAP server in e-education system network infrastructure

authentication and authorization are shown in Figure 5. and described in details in Despotovic, (2001).

Process integration in e-education

Information system of postgraduate studies is developed and divided into five main modules: Basic data, Education (curriculum, exams, specialist's, MA and PhD papers), Students (students' transactions, payments for taking exams and tuition), Financial data (teachers' transactions, salaries and fees, paid and issued invoices), and Reports. The business model of distance education obtained through integration of business information system, LMS Moodle and Microsoft Collaboration Servers is shown in Figure 6 (Piotrowski, 2002).

Integration of applications in e-education

Technical realization of the integration from the aspect of infrastructure and Internet services is illustrated in Figure 7.

E-education system is realized through applications which use the systems like Linux, PHP, MySQL, whereas, on the other hand, some of the realized applications are based on NET technology. Integration of these applications, which are based on two essentially different technologies, is carried out by the use of XML Web service.

The base of the system is an operative system Windows Server 2003 providing core infrastructure and usual services in the following categories : security infrastructure (Microsoft Internet Security and Acceleration (ISA) Server, Microsoft

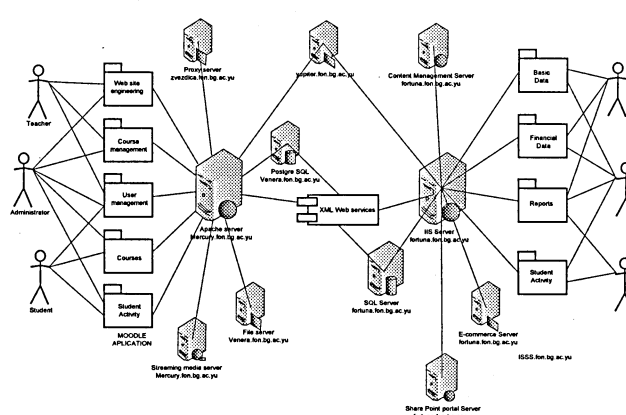


Figure 7 Integration of business information system, Moodle LMS and Microsoft collaboration servers

Windows Rights Management Services); core services, operations and management (Microsoft System Center, Microsoft Systems Management Server, Microsoft Operations Manager); application infrastructure (Microsoft SQL Server, Microsoft BizTalk Server, Microsoft Commerce Server, Microsoft Host Integration Server, Microsoft Speech Server); collaboration infrastructure (Microsoft Exchange Server, Microsoft Office Live Communication Server, Microsoft Office SharePoint Portal Server).

Conclusions

With the development of Internet technologies electronic education becomes more and more important component of the permanent, primary and postgraduate education. This paper gave a survey of e-education concepts, methods and technologies. In order to have the effective distance education, it is necessary to connect learning management software to the business information system of the educational institution. The paper suggested an integration method based on the integrated authentication and authorization process, which is based on LDAP protocol, communication and data exchange by means of XML web service. As an example of the suggested method, the paper gave a survey of the realization of the distance education system at postgraduate studies at the Faculty of Organizational Sciences, which unites communication infrastructure, basic Internet services, services for interactive communication, business information system, and education contents management system.

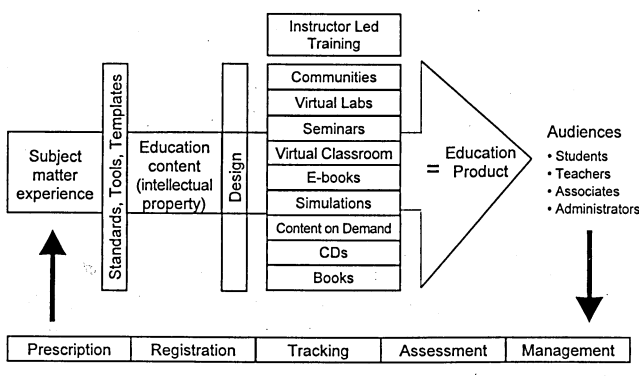


Figure 6 Process Integration in e-education

Súhrn

Článok sa zaoberá integráciou vzdelávacích procesov a využitím príslušných softvérov prostredníctvom organizácie štúdia, realizácie vzdelávacích a výskumných procesov a obsahového manažmentu. Vývoj informačných technológií umožňuje efektívnejšiu výučbu zameraním sa skôr na prenos vedomostí ako na ich prezentáciu a účinnejšie štúdium za využitia subsystému služieb pre študentov a systémy manažmentu procesu učenia sa (LMS). Popisuje sa implementácia tohto nápadu pomocou fakultného intranetu a LMS. Ako konkrétny príklad sa uvádza analýza procesu elektronického vzdelávania a integrácia softvérových komponentov na Fakulte organizačných vied na Belehradskej Univerzite.