

Analyses of Web-based Systems for Electron Distant Learning

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Abstract: *The need of Web-based systems for electron distance learning (SEDL) is examined in the present paper. The existing world standards and environments for Web-based electron distance learning have been analyzed. The basic components and factors in the process of automated learning and the used technological modules have been defined. The various basic components building the software of the system for electron distance learning have been analyzed and reference points for their optimal choice have been defined.*

Keywords: *electron distance learning, automated learning systems, open learning environments, technological learning model, Web-based programming languages, Web server, database management system.*

1. INTRODUCTION – ANALYSES OF THE NEEDS TO APPLY WEB-BASED SEDL

1.1. ASSESSMENT CRITERIA FOR THE LEARNING EFFICIENCY

The **efficiency** of the secondary, college or higher **education** has been defined by the following four criteria:

- Quality of the students at the end of the learning.
- Duration of the learning. If there are preconditions for individual learning, then a part of the learners will be able to complete their education in shorter time comparing to the other learners.
- The spent money for carrying out the whole learning cycle. The less are they the more is the efficiency of the education.
- Transforming the consecutive form of secondary education into a parallel-consecutive form. This will allow at completion the secondary education to pass some of the exams from the higher education.

1.2. DRAWBACKS OF THE TRADITIONAL LEARNING FORMS:

- Lack of motivation of the learners and the tutors;
- The traditional form of education requires using buildings, which are not free of charge (heating, lighting, repairs, maintenance, etc.);
- The learning process is carried out considering the possibilities of the medium knowledge learners;
- In most of the cases the terms are fixed, etc.

1.3. REASONS, REQUIRING APPLYING THE WEB-BASED SEDL

- New information and communication technologies (telecommunication, multimedia, Internet and other technologies) have been aroused and implemented.
- There are trends to globalization in the world, information boom in many areas of life. It is necessary the students, specialists and scientists from various geographical sites to work in team for solving complex problems;
- The students require new learning forms. They want to be more mobile, to complete their education earlier, to be free to distribute and use their time;
- Economical and didactical constraint. The students pay fees which increase continuously and this is a reason for them to work more efficient.

2. SYNOPSIS OF SPECIAL INSTRUMENT TOOLS AND ENVIRONMENTS FOR CREATION COURSES FOR ELECTRON DISTANCE LEARNING

Some of the most popular specialized means for development of courses for EDL have been suggested by:

- **Docent company** [2] – Their solution is Docent Enterprise, allowing to organize distance learning.
- **BlackBoard company** [3] – They suggest BlackBoard, and also ASP services for educational institutions. BlackBoard consists of three basic applications: course, management system, unifying portal, allowing access to the resources, course

administration, dialogue tools, schedules, etc. for the corresponding categories of users; system for identification of the students allowing their access, management of the education tuitions, etc.

➤ **Moodle** [4] is a course management system created to help the tutors, who want to create qualitative on-line courses. The software is used around the world by many universities, schools, enterprises and independent tutors. The system Moodle has got open code and is completely free to use.

➤ The programming learning environment **Leaning Space (Lotus/IBM)** [5] gives opportunities for studying and teaching in asynchronous mode, access to the course resources in proper time and participating in the on-line lessons in real time.

➤ The integrated environment for development and using net courses **WebCT** [6] is one of the most powerful and popular means in the world for development and applying net courses. The net learning technology WebCT supports the IMS (Instructional Management Standards) standards.

➤ The system **Prometeus** [7] is a programmable environment which supplies electronic distance learning and testing of the learners and also allows management of all the activities in the virtual learning institution.

➤ **Oracle e-Learning** [8] is a product intended for administrating the learning processes supposing complex and cheap solution for carrying out learning. The product Oracle e-Learning can be used as in internal organization service, and also as an Internet resource.

➤ The system **Claroline** [9] is a product oriented to suggest and manage learning courses. It allows the tutors to create, administrate and suggest their courses in Internet.

➤ The electronic learning system **Microsoft Class Server** [10] is an information software product which realizes a multi-functional system. The system is intended to append the traditional education, rather to replace it. That is why its authors foresee for it to be used mainly for out-of-class learning. It is possible also to be used in class using laboratories with special equipment.

➤ **Ready Go** [11] and **Web Tutor** [12] are distant learning systems. The packages include Tests, Electronic conferences, Management of learning site contents, etc.

➤ **Arcade** [13] – Software platform for electronic learning, used by Sofia University “St. Kliment Ohridski” for electronic learning processes management (distant, traditional and mixed).

Exemplary architecture of the software platform similar to Arcade is shown in Fig.1.

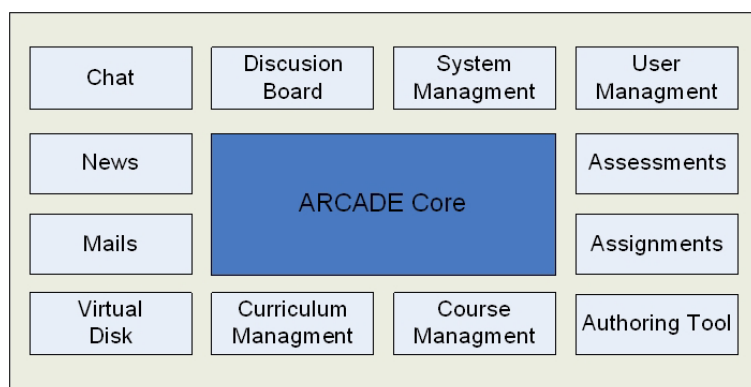


Fig.1. Architecture of the modern platform Arcade

➤ **MSCS** [14] – The Software platform for electronic learning, used by the Technical University of Sofia is based on the standard LTSA.

The structure of the components of the standard IEEE P1484.1 LTSA (Learning Technology System Architecture) is shown in Fig.2. The base of the components organization is four main processes, data storages and thirteen information streams.

3. METHODOICAL AND TECHNOLOGICAL RESOURCES OF THE SYSTEMS FOR ELECTRONIC DISTANCE LEARNING

3.1. BASIC COMPONENTS AND FACTORS IN THE AUTOMATED LEARNING PROCESS

The automated learning is carried out in interactive mode and has the following basic components: a learner, a tutor, and learning factors.

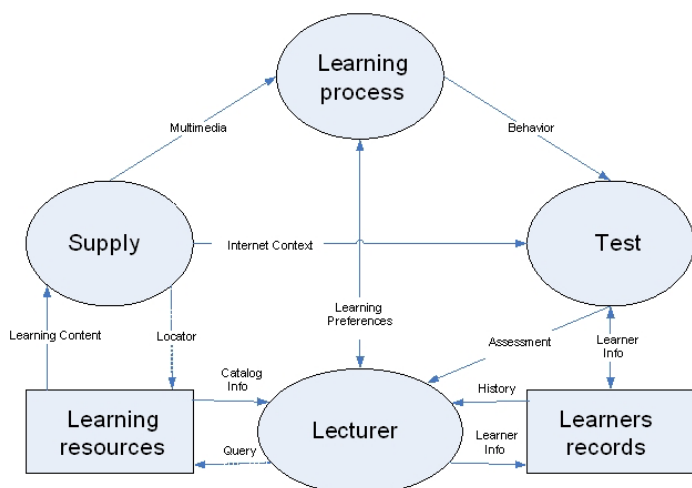


Fig.2. IEEE LTSA architecture of the system components of the environment for E-learning

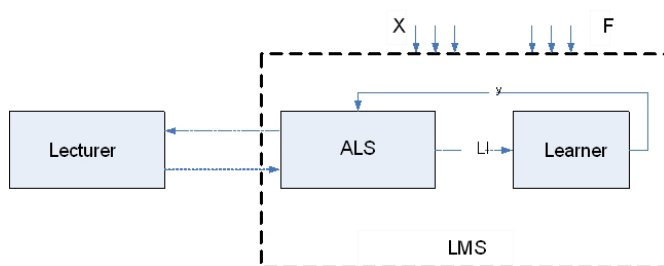


Fig.3. Basic components and factors in the automated learning process

The Automated Learning Systems (ALS) can be specialized and universal, depending on the used hardware and software means. On the other hand depending on the position of the learner and the tutor, ALS is for local and for distance learning.

The basic components and factors of the automated learning are shown in Fig.3.

The main function, which an automated learning system implements, is to control the learner, to acquire knowledge, skills and habits. From this point of view the couple of blocks **ALS - Learner** can be examined as a Learning Management System (LMS), in which:

- **ALS** is a subject of the management, a source of control and learning actions or an initiator of the interaction;

- **LI** is a learning influence, generated by ALS and it can be a lecture, a task for individual or group

realization, test questions for assessment of the grade of learning the material, etc.;

- **Learner** - an object of the control in LMS, who's state (the grade of knowledge) changes during the learning process;

- **X** – The conditions of the working environment, at which the learning process is carried out;

- **F** – Characteristics and behavior of the learner (type of reactions, state, presence of their own objectives, motivation, etc.)

- **Lecturer** – who makes the learning courses, the tests for control of the grade of the learning the material, gives additional tasks, assesses the results form the learning process, formulates the creative achievements of the learners, etc.

When the learning courses are on an electronic storage and the tutor and the learner are separated in the space, then there are preconditions for an electronic distance learning (EDL).

When the communication between the tutor and the learner is made by the means of Internet or Ethernet using Webbased software, as well as Web-based user software, the system and the technology of learning is called Web-based System for electronic distance learning.

3.2. TECHNOLOGICAL MODELS IN THE SYSTEM FOR EDL

The unit model form a distance learning course is shown in Fig. 4.

The technological assessment model of the system for distance learning has the components shown in Fig.5.

Stages of the distance learning process:

- Development the knowledge base and of SEDL;
- Gathering information (knowledge, messages, tests, tasks, etc.);
- Learning (absorption of the knowledge, solving the tasks, systematizing, development, etc.);

- Assessment (receiving the results from the solved tasks, the answers of the test questions and confrontation with the assessment criteria).

The main activities, implemented at the distance learning are:

- Servicing the process;
- Management and implementation of the stages;

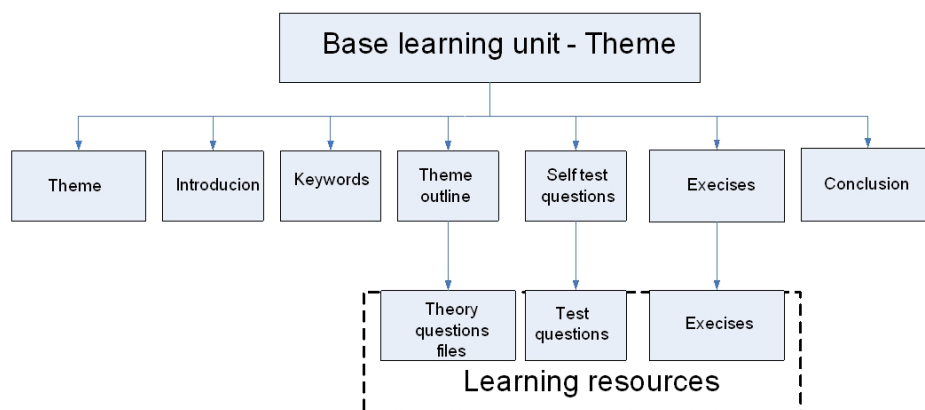


Fig.4. Unit model from a course for SEDL

- Information resources.
- Technological means, used at SEDL;
- Used means (hardware and software);
- Used approaches;
- Used forms for input and output information.

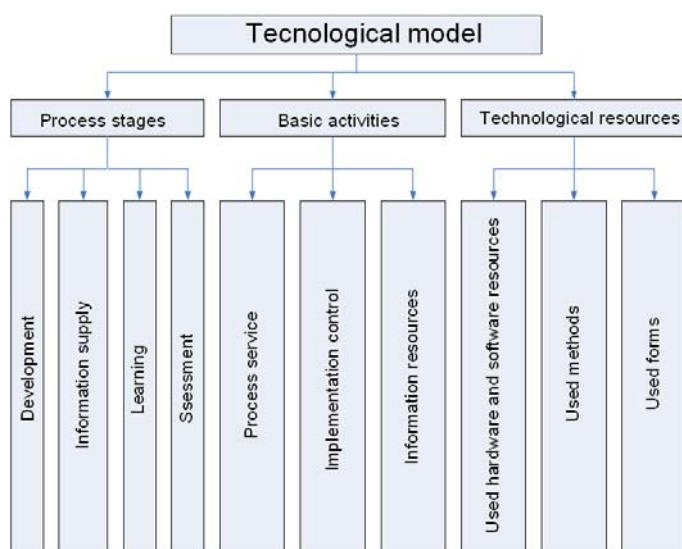


Fig.5. Components of the technological model

4. SOFTWARE OF THE SYSTEM FOR ELECTRON DISTANCE LEARNING

4.1. WEB SERVER OF THE SYSTEM SEDL AND PRINCIPLE OF OPERATION

In the existing world net Internet to control the operation of distinct clients Web server is used. There are many firms, which have created such servers, but one of the most spread is Apache [15, 16].

➤ The basic modules used by the Web server Apache in SEDL are three (Fig.6): File management module, Script management module, Database management module. The blocks of the server have connections between them and with the objects to which control they are intended.

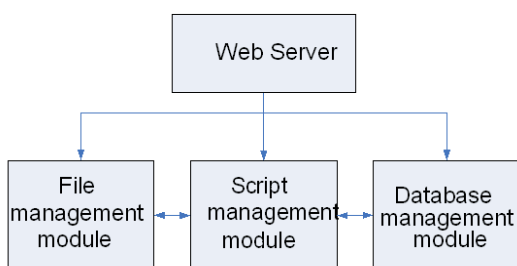


Fig.6. Basic modules, used by the Web server Apache in SEDL

➤ The characteristics which the Web-server must has got are the following: to operate with most possible speed, to work in multi-task mode, to answer when there are mistakes in the messages, to be able to work with many different data formats JPEG, GIF, TIFF, BM, etc. Other feature is to receive the client requests, to send them to real servers

and to send the answers to the clients after that.

➤ Principle of operation of the Apache server. The essence of the operation of the Web server is to transform one **URL address** into a file name and to send this file after that back via Internet, or to transform it into a program name, to execute this program and to send the result back.

When the user sends request by the corresponding program *nporpama*, it connects with the corresponding server by the corresponding port. After connecting with the server it sends a command GET to a HTTP port. The server manages the user request sending back one of the following answers: sends back the required file (client) or sends back an answer that the file and/or directory does not exist or the access to the file or the directory is denied, etc. Similarly to the command GET other commands, defined by the client, may be executed.

4.2. CHOICE OF WEB BASED PROGRAMMING LANGUAGES FOR SEDL

➤ Programming languages classification

Web based non-script languages are Perl, CGI, Python, Java, Basic, etc. Web based script languages: HTML, PHP, Java script, Perl, VB script. Most frequently used Web based programming languages are PHP, Perl, ASP, JSP.

➤ Comparative analyses of non-script and script programming languages

Web based programming languages can be divided into two basic groups: **script** and **non-script**.

Comparing between non-script and script programming languages

The programs written in non-script languages are preliminary compiled by the corresponding computer and as a result an executable file is made. When the executable file comes to the Apache server, the server sends it to the OS to be executed and the result in form of a text is sent back to the Apache server. Depending to the HTML commands, which are in the sent back text respective actions are carried out by the Apache server.

The programs written in script languages are executed by the respective module of the Apache server, sending the contents of the HTML in format, including the respective HTML commands, which are executed. When the Apache server meets a program fragment, written in script language, it calls the respective interpreter program, replaces the corresponding fragment with text, and after that continues the processing of the HTML program.

A brief comparison between the script languages PHP and Java shows that:

PHP scripts have been executed by the server and Java scripts have been executed by the client.

The basic advantage of the PHP scripts [16] is that the resources on the client's side can be less, because no additional programs are required by the client. Other advantages of the PHP language are that it is easy to further develop, learn and apply. Except that the PHP scripts are more reliable, but slower. Another advantage of the PHP scripts: they have less commands, hence the programs are shorter. The PHP programs do not require additional tools of the client except a Web browser.

The main disadvantage of the PHP scripts is the bigger loading of the server, the more required processor time, more RAM and lower speed of the system as whole.

The main advantage of the Java language is the less resources required by the server, i.e. the server is less loaded. A disadvantage of the Java scripts is required interpreter program on the client's side, and except that the safety is decreased, for example execution of script commands for formatting the hard disk of the client. In order to avoid undesirable results at the client, it is prohibited execution of some commands.

From the comparative analyses made between non-script and script languages, and also between PHP and Java scripts some advantages of the PHP language can be seen. Considering the fact that it is free of charge, it is preferable to choose the PHP language at the development of the system SEDL.

4.3. CHOICE OF DBMS FOR SEDL

Some of the basic DBMS spread in Internet are MySQL, MSSQL, POSTGRE SQL, ORACLE, Firebird, etc. Supposing the criterion is that DBMS must be easily accessible and free we can eliminate the systems MSSQL and Oracle although the system Oracle is professional.

Considering the main characteristics and the criteria for cheap and with high speed DBMS, universal in relation to the used platform – MySQL and PostgreSQL can be used. But considering that for the developed system it is not necessary to use special functions, and also to decrease the required memory and to increase the speed, it is preferable to choose DBMS MySQL [16].

5. CONCLUSION

The contributions in the suggested work can be systematized in the following way:

- An analysis of the needs of applying Web-based SEDL has been made. Criteria for efficiency of the education have been defined.
- Existing world standards and environments for Web-based Electron Distance Learning have been analyzed.
- The basic components and factors in the process of automated learning and also the used technological models have been defined.
- Varieties of the basic components, building the software of the system for electron distance learning have been analyzed and reference points for their optimal choice have been defined.

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