Analysis of e-Learning Strategies Used to Deliver Knowledge in the Digital Age

Ileana Adina Uță, Floarea Nastase, Cristina Pop

Abstract: *This paper presents a comparative analysis of e-Learning systems and strategies used to delivered knowledge in the digital age. Currently there are different e-Learning platforms, but each of them has advantages and disadvantages. We would like to propose a collaborative platform developed by teachers and students that is capable both, of visualization of e-Learning data from server and of server monitoring of user actions like intervals between mouse clicks on different e-learning content. Students who attend an online lesson get the information from the teacher and from his colleagues too. This type of lesson can be accessed anywhere and anytime and students can work together.*

Key words: *Collaborative Learning, E-Learning Strategies, Knowledge Delivery, Server Monitoring.*

INTRODUCTION

Online learning is changing the traditional forms of teaching used in education. It is argued that, if managed correctly, online learning methods can add value to traditional face-to-face methods and provide opportunities for reducing some of the weakness of traditional teaching methods. Online learning takes on its forms, structures and discourse, in the same way as traditional classroom-based and face-to-face learning. What is fundamentally different is the nature of the medium and its added dimensions in time and place. The change of medium offers new opportunities to move some of the contemporary and the traditional approaches towards learning in more interesting and efficient ways. The infusion of the IT&C in the educational systems, at different levels and different forms, as a possible solution for identified problems, became familiar. But use of IT&C in the educational landscape assembled a lot of other questions marks concerning the educational value of this use in terms of learning quality.

1. WEB-BASED TRAINING SYSTEMS, ADVANTAGES AND DISADVANTAGES

The target group for the e-Learning is represented by scholarships and students. They need to accumulate a large variety of knowledge, to learn how to think, to connect all schools values with the life reality, to transform the theory into practice and so on. For this reasons, the e-content prepared to be delivered by IT&C infrastructure, designed for self learning or assisted by the teacher, has to be in full accordance with the didactical and pedagogical principles [3].

- Students participate from a variety of locations and may "attend" multiple learning institutions and/or their local school;
- Students may determine the times when they access e-learning opportunities. Students can choose to work individually or collaboratively with people who may or may not be in their regular class;
- Classes may be synchronous or asynchronous;
- Students may take classes from more than one school;
- Students may set their own objectives and explore their own learning needs and agendas;
- Students can follow a non-linear path at a pace that meets their individual needs at that time, i.e. just-in-time learning;
- E-teachers can work in more than one school;
- Students can proceed at their own pace;
- Students can replay audio lectures or video clips;
- Slower students do not slow down their classmates.

Of course there are also a few disadvantages like:

- The teacher has to work harder for a successful online course to replace verbal explanations;
- The course must be interactive otherwise the students lose interest and give up;
- The work must be done by teams of teachers, administrators and students;
- There has to be a good connection to the server so the clients can get the answers very quickly;
- The software does not have to be very expensive, and without implementation errors.

A survey questionnaire was developed to measure academic student's perception of quality assurance in Web-based training. The measurement of the items was drawn from a study carried out by the Academy of Economic Studies. An example of the item is as follows: A. How often do you use computer for the following activities (i.e. learning, writing text, and creating spreadsheets, image processing, chatting, searching information on internet and sending emails)? B. What do you think about using Web-based Learning?

Table 1. Results of a recent survey

		Daily	Several times a week	Several times a month	Occasionally	Never
(A)	learning	94.00%	6.00%	0.00%	0.00%	0.00%
	writing text	73.91%	21.74%	4.35%	0.00%	0.00%
	spreadsheets creating	16.33%	24.49%	30.61%	28.57%	0.00%
	organization of meetings or other activities	31.91%	27.66%	17.02%	19.15%	4.26%
	image processing	22.45%	24.49%	26.53%	26.53%	0.00%
	play games	14.29%	12.24%	22.45%	44.90%	6.12%
	sending emails	63.27%	26.53%	6.12%	4.08%	0.00%
	cheating	72.92%	10.42%	2.08%	10.42%	4.17%
	participate in discussions on forums	10.20%	22.45%	14.29%	40.82%	12.24%
	searching information on internet	91.84%	8.16%	0.00%	0.00%	0.00%
	website creation or publication of information on the Internet	8.16%	12.24%	10.20%	48.98%	20.41%
(B)	Computer-based learning or Web -based learning should play a greater role.					82.00%
	Web-based learning programs can replace traditional courses					18.00%
	Web-based training should be available as a substitute to traditional lessons					90.00%
	E-learning should not be anything more than a way of sharing information over the Internet					10.00%
	I find it is difficult for me to talk in the classroom, so most times I fail to do so. It would be easier to participate in online discussion forum.					16.33%

From Table 1 it can be seen the major role of the computer in the learning process (94% of students using it daily and 6% a few times a week), in looking for information on the Internet (91.84% of students) and in communication: e-mail (63.27% of students using it daily and 26.53% a few times a week) and chatting (72.92% of students using it daily and 10.42% a few times a week).

Regarding the usefulness of web-based instruction, students believe that it should play a bigger role than at present (82% of students) but it cannot replace traditional

education (82% of students) and should be used to substitute traditional lessons (90% of students).

2. COMPARATIVE ANALYSIS OF THE MOST POPULAR E-LEARNING SYSTEMS

The presented systems are analyzed in terms of technology and architecture used to implement the following components (authoring tools, knowledge pool system, course manager, user interface, providing facilities for training).

2.1. Ariadne system architecture

ARIADNE (Alliance for Remote Instructional Authoring Networks Distribution for Europe) was developed by a group of European universities and offers many tools for creating and distributing online courses. Computer based training may be developed by analyzing the relationship between user and system during the training process [5]:

- During the first part of the instructional process the user's main activity is the acquisition (assimilation) of concepts and information in the required field. All these may be presented as text or video and audio;
- The next step is to solve exercises, problems, quizzes;
- Then the user interacts with another person from the group, that person can be the teacher or another student. The communication between users may be synchronous or asynchronous (asynchronous communication does not require that all partners involved in the communication need to be present and available at the same time).

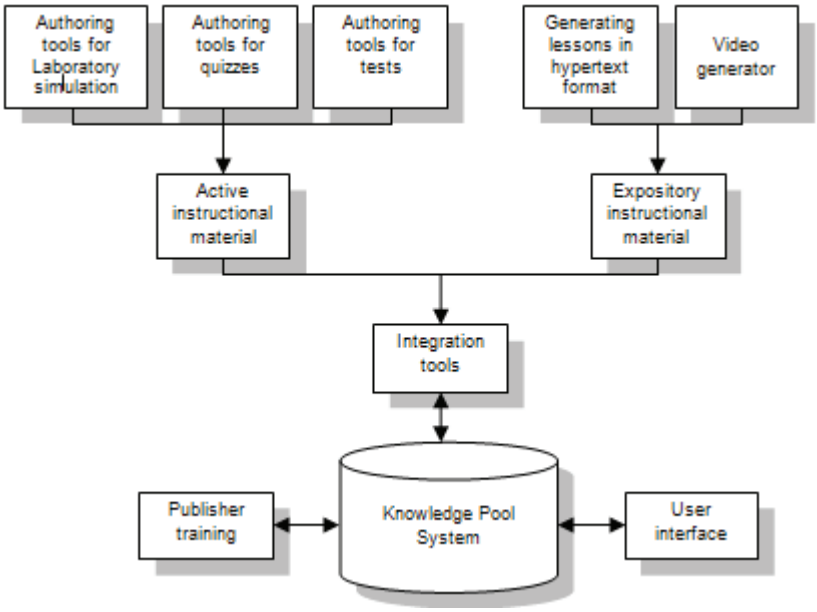

Fig.1. ARIADNE system architecture

Analysis of the ARIADNE system by its architecture (Fig.1) highlights the following components:

1. Authoring tools, for creating instructional materials. These materials can be created from the beginning or from a material that already exists.
2. Knowledge pool system is a complex system used for storing, indexing, classification and finding objects with instructional content. Central database is at the Catholic University of Leuven, Belgium. It is connected to regional databases; each regional database is linked to local databases.

3. Pedagogical Header Generator & Validation Rule, allow integration of new documents in the database.
4. Curriculum Descriptor File is a tool used by instructors to create curriculum (a teaching process with a fixed period of time).
5. Student interface that allows accessing the course schedule, the choice of sessions, the access to course materials or the use of external resources and communication.

For the implementation of the ARIADNE system were combined two current information technologies: Web technologies (for access to instructional content) and relational databases (for storing the content). ARIADNE system performances are demonstrated by its successful use in many European universities. This system is one of the most used web based training system in Europe.

2.2. WebMentor - a complete Web-based training

WebMentor is an online training software developed by Avilar Technologies and is the first certified SCORM Learning Management System. WebMentor uses a role-based architecture. These roles are implemented in WebMentor [7]:

- Course author. He creates course content including lessons, exercises and tests, in HTML format.
- Course provider. He installs courses and provides them for organizations or individual students using the system administration functions of WebMentor;
- Course manager, manages one or more courses for an organization, assigns instructors for training sessions and he also monitors progress of students using the system administration functions of WebMentor;
- Course instructor, coordinates one or more specific course sessions, monitors progress, work and skills acquired by students during the session, directing them towards their goals.

The technology used for implementation is thin-client, so the student only needs a modern Web browser without installing additional software on his computer. The access to the system is being controlled by a procedure based on password authentication and privileges.

2.3. AeL (Advanced E-Learning)

AeL is a learning content management system used in high school. This platform offers some opportunities to optimize the teaching-learning process:

- A virtual classroom which gives a new dimension to teaching and learning process;
- A library that is as a resource centre to reach teachers with an excellent range of information;
- Discussion forums, where communication takes place within a network of professionals that can provide support for efficient tasks.

From our experience, this platform can be successfully used by any teacher. Students are excited about how the computer can help to understand some difficult lessons in chemistry, physics or biology.

3. PROPOSED ARCHITECTURE OF AN ADVANCES E-LEARNING FRAMEWORK

The general architecture of the proposed e-Learning framework uses a typical 3 layered software architecture. The main responsibilities of server include learning modules storage on a pertaining web server and delivery of e-Learning data content on client software application request. The remote client application sends requests to Server and

snapshots with student actions on predefined time intervals set by the trainer. For a particular client request, the server decides on and takes the appropriate action.

This can be represented graphically as in Fig.2.

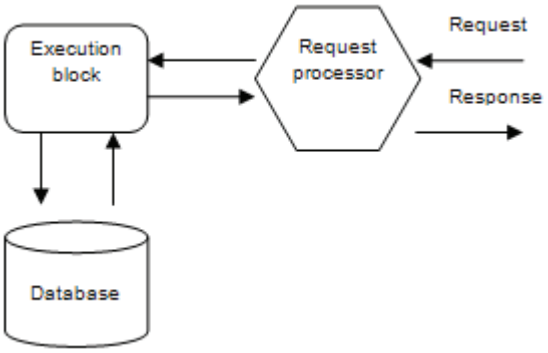

Fig. 2. e-Learning server general architecture

The main functions of each block are explained below:

- Request processor takes as input a request and interprets it. After all request characteristics have been determined, it is up to the execution block to act appropriately.
- Execution block communicates with both the request processor and the e-Learning Database content in order to execute the client request. It must be mentioned that this layer executes when the request characteristics have been determined by the request processor layer and only then.

Both, requests and responses can take message or file transfer forms, depending on the specific context. A simplified graphical representation of the Client application architecture is presented in Fig.3.

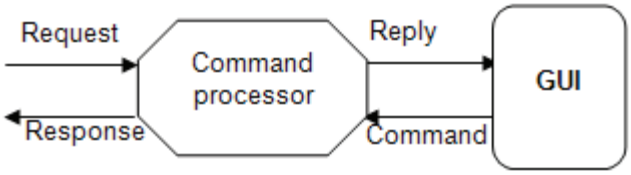

Fig.3. Client software application general architecture

As it can be easily seen, all that happens is driven by user commands, making use of a well-designed graphical user interface. The command processor is a logical entity that transforms client requests into an appropriate format for the server to understand and process, including here http request to the web server contained by the e-Learning server. All these requests are transported between client and the server encapsulated in a general request type, this ensuring both, flexibility and extensibility for the request transport level. The communication mechanism between client and server uses both messages and files. The data interchange operation is realized via file transfer making use of standard XML language. Also, the client has to have a username and password in order to connect to the server. The provided username and password enable the user to use the educational resources from different workstations and personalize the learning process. For each user predefined settings can be set by the corresponding teacher such as lessons to attend, obtained marks, to ensure a controlled learning environment, but leaving in the same time the learner the possibility to advance in his own way.

The novelty of this proposed architecture is that web content is delivered via an graphical user interface that is capable both, of visualization of e-Learning data from server and of server monitoring of user actions like intervals between mouse clicks on different e-learning content, navigation tree and verification questions via which the e-Learning server is capable of deciding which level of e-Learning content to deliver on subsequent lessons as well as giving the monitoring teacher the possibility to visualize the attention given to a specific lesson by a group of student.

For example the student studies a brief material, after that he has to pass a multiple test choice. According to his grade, he may pass to the next level or he has to study the same material presented in a different way. One of the reasons the grade is not good enough is that the student did not pay enough attention to the content he reads and this can be seen by server monitoring of student actions like intervals between mouse clicks on different parts of the content.

CONCLUSIONS AND FUTURE WORK

This article examines, analyses and evaluates Web-based training systems, and the final part of the article gives an alternative architecture of an advanced e-learning framework. Future work may include examining the platform usefulness in a large-scale e-learning environment and enhancing it with characteristics for each student needs. Using Web educational context can lead to implement a student-centered learning model.

REFERENCES

[1] Bryan Holmes and John Gardner, *e-Learning concepts and practice,* Sage, 2006.

[2] Implementation of *Education and Training 2010* work programme, European Commision Directorate General for Education and Culture.

[3] Jolande Leinenbach, *ELearning management: A handbook for teachers, trainers and managers in learning organisations,* Polirom, 2007.

[4] Maggi Savin-Baden, *Problem-based learning online,* Open University Press 2006, pp. 121-132.

[5] Mihaela Brut, *Instrumente pentru e-learning. Ghidul informatic al profesorului modern,* Polirom 2006, pp. 110-115.

[6] Ruth Colvin Clark & Richard E. Mayer, *e-Learning and the science of instruction,* Wiley, 2007.

[7] Ruth Colvin Clark & Ann Kwinn, *The new virtual classroom,* Pfeiffer, 2007.

[8] Shirliey Bach, Phillip Hayness, Jennifer Lewis Smith, *Online learning and teaching in higher education,* Open University Press 2007, pp. 180-191.

[9] Sorin-Aurel Moraru, *Preparatory Module Course,* Lux Libris 2004, pp. 112-117.

ABOUT THE AUTHORS

Prof. Ileana Adina Uță, PhD, Economic Informatics Department, Academy of Economic Study, Bucharest, Romania, Phone: +4 0723 276 730, E-mail: adinauta@ie.ase.ro

Prof. Floarea Nastase, PhD, Economic Informatics Department, Academy of Economic Study, Bucharest, Romania, Phone: +4 0732 438 641, E-mail: nastasef@ase.ro

Cristina Pop, PhD candidate, Economic Informatics Department, Academy of Economic Study, Bucharest, Romania, Phone: +4 0727 044 281, E-mail: cristinel19@yahoo.com