

THE E-LEARNING SYSTEM STRUCTURE WITH VIRTUAL LABORATORY

A. CATARIOV, V. NEGURA

Technical University of Moldova,
vnegura_md@yahoo.fr

Abstract: In the paper is presented the results of e-Learning system design for the computer engineering courses for the Computer, Informatics and Microelectronic Faculty (TUM). The described e-Learning system foresees as a structure component the integration of Virtual Laboratory (or Remote laboratory).

Key word: E-Learning, Virtual Laboratory

The education process based on e-Learning is known as a concept which, grace to ICT, facilitates and enhances the traditional learning. On that account e-Learning is one of the main topics in the action plan eEurope 2005 [1-4]. The e-Learning is one of the main goal of the strategy for implementation of informational society in Rep. of Moldova, and the drive that propel to move to knowledge-based society.

E-Learning has the next benefits and advantages:

- Technologically revolutionize the learning;
- Is accessible for anyone, anywhere and anytime;
- Offers substantial cost savings due to elimination on travel expenses;
- The timely information can be retrieved and accessed just-in-time;
- The customizing and the personalizing of the learning material to the students needs contribute to a more lasting learning effect;
- Improve collaboration and interactivity among students;
- Eliminates the student embarrassments of failure in front of group, therefore is less intimidating than instructor-led courses;
- The information delivered to all users can be consistent, therefore reducing the possibility for misinterpretations;

1. THE STRUCTURE OF E-LEARNING SYSTEM

In order to implement an e-Learning system, a field investigation is made first on the environment where the system is required. This involves the geographic area, the teaching field, the potential learners, the applicable technologies and other features that can belong to the system.

Depending on all of these, the system will assume the possibility to satisfy more or less the proposed objectives.

As geographical area, it can be mentioned the individual PC, LAN or WAN (Intranet), and Internet. In the first case, the system works independently for each user and it is distributed on such supports as CD or DVD. In the case of Intranet, the systems are applied inside of companies, universities, governments; departments etc. and refer to their type of activity. However, through Internet, the area can be extended on the whole world and so the number and categories of users rise considerably. In this case, the system complexity has its quiddity. The first thing is that the system should manage a big number of users, who can overburden it, efficiently ensure the distribution of resources by rights and priorities, also a set of statistics and other special presented tasks. To implement such kind of system, Web technologies are used at large, where a simple browser can be used to access the system without any special difficulties.

The users of an e-Learning system can be divided in:

- **Administrators** – take care of a good functionality of the system and thus, they have full access to all functionalities with a design to be able to test them and to check the validity of data;
- **Teachers** – the users who have to prepare the learning courses, tests and to evaluate the learners' performance;
- **Supervisors** - they are those who follow the stream of system subscribed learners, create groups of learners, notify them in special cases and other routine activities;
- **Learners** – the most numerous kind of users. They are those who wish to be taught through the learning courses of the system. They can participate individually or in a group. The last one is more preferable because it is possible a collaboration between *virtual classmates*, thus, they constitute *virtual classes*
- **Learning Object Repository or Content Management System** – this is the place, where the learning material is stored. As learning material or learning object we can understand the resources in digital format that provide a learning experience of some kind. This kind of system represents a specialized database gifted with various search engines, content aggregation of courses, documents circulation etc.
- **Learning Management System (LMS)** – this is a software application or a Web application which allows the managing of the learning process. It involves an additional database to hold the information about learners, their access rights, their assigned courses, the collecting and storing of the information that refers to the users' actions. In other words, this is the core of an e-learning system. Such kind of systems can be very various, in special, in the way of course presenting. Some of them can allow the using of audio/video information, others audio/video conferences or only graphics/text information. The learning process can be *asynchronous* or

synchronous. In the first case, the learners are free to access the system any time, but in the second one, all learners (they can be only from a group) access the system in the same time. This has an advantage as they can collaborate and communicate to each other in order to make the learning material easier to understand. For this thing, different means are used: video conference, chats and others. For off-line communication, the system can use *email* or *forum*.

- **Authoring tools** – these use different textual, graphical etc. editors to create the learning courses of the system. In addition, it can involve different kinds of programming (ex. visual, scripts). A typical popular tool can be mentioned- LERSUS- that allows many facilities to prepare learning courses. It permits to use textual, graphical, audio information and animation. And an important feature is the exporting of the results in different standard formats such as HTML, PDF, XML and even SCORM.

- **Virtual laboratory (Remote laboratory)** – it is a relative new element of the e-Learning world. Such module can be implemented by the simulation or by the real-time distantly steerage of the experimental device.

Those enumerated previous are the component of the e-Learning structure.

The structure of proposed e-Learning system is presented below, on the figure 1.

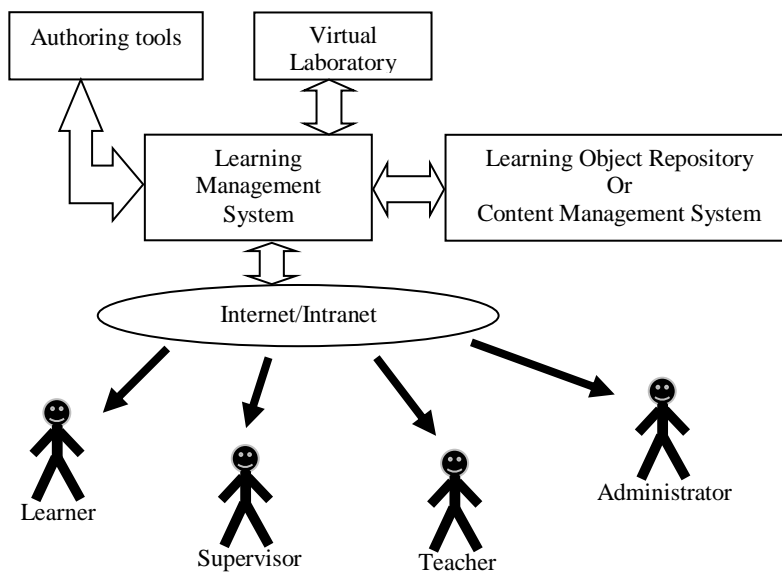


Fig.1. The structure of e-Learning system

Laboratories, which are found in all engineering and science programs, are an essential part of the education experience, is an important component of the lecture where students gain hands-on experience. However equipping laboratory is a major expense and its maintenance can be difficult. Teaching assistants are required to set up the laboratory, instruct in the laboratory, and grade lab work reports. With National Instruments LabVIEW Remote Panel [5] we plan to build remote laboratory for the lot of computer engineering courses and include it as a part of e-Learning system. LabVIEW Remote Panels turns the application into a remote laboratory with no additional

programming or development time. With this standard feature of LabVIEW, a user can quickly and effortlessly publish front panel of a LabVIEW program for use in a standard Web browser.

2. E-LEARNING STANDARDS

Now, the necessity of e-learning standards developing makes no questions of. The main factors that speed their progress are:

- The necessity of using the cumulated learning objects from a library independently of the used technical means in the moment of elaboration;
- The necessity of involving the e-learning means in the business process of companies, that, on technical level, means the integration of e-learning systems with other corporate informational systems;
- The necessity of exchanging the learning objects among different e-learning systems.

The main directions of standardization are vocabularies and taxonomies, architectures, learner information, learning content, management system and assessment.

The most processed groups of standards are those that describe the learning objects and the learning management systems. For the present, the unique standard is still in the developing process, but several standards have been using already in practice:

- **ADL SCORM(Shareable Content Management Reference Model)** – it was created by ADL(Advanced Distributed Learning) initiative formed by the USA Department of Defense in 1997, in order to share distance learning objects among different LMSs used within the Department. Also, to ease the searching, the retrieving and the reusing of learning objects in the repositories. The types of SCORM specifications are: *content aggregation model; run time environment and sequencing and navigation.*

- **AICC(Aviation Industry CBT(Computer-Based Training) Committee)** – an international committee which has been developed e-Learning specification initially in aviation industry to improve the developing, the deployment and the evaluation of learning courses and systems involved in the process of the computer training. Since 1993 AICC has developed **CMI Guidelines for Interoperability** specification, which standardize the interaction between LMSs and CMSs (learning objects)

- **IMS/GLC(Instructional Management System Global Learning Consortium)** – the main its activity directions are: the definition of technical specification to organize the interaction between applications and services which participate in the e-Learning process; and the supporting of including the IMS specifications in the process of software and services developing from whole world. There are four wide-spread specifications: *IMS Question & Test Interoperability Specification; IMS Learning Resource Metadata Specification; IMS Content Packaging Specification; IMS Learner Information Packaging.*

1. CONCLUSIONS

The e-Learning systems, which arrive instead of traditional learning systems, offer tremendous possibilities for learning for all indifferently of person, time and location. They became an attribute of the future based-knowledge society-informational society.

2. REFERENCES

1. www.euractiv.com
2. www.lersus.de/res/modules
3. www.learnframe.com
4. www.elearningeuropa.info
5. www.natinst.com