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E-learning management systems in Hungarian higher education

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Abstract. Computers, informatics, and information technology have an ever-increasing role in the establishment and spread of new educational forms and methods. The role of e-learning as a new educational model is increasing in the world of computer networks, because of a widespread access to the net and a growing demand for learning beside work.

Technological elements of e-learning can be separated as Learning Management System, authoring system, course material and a browser. Learning Management System is the software package that creates the structure of the whole educational process: course organisation, course material presentation, tracking student work, recording results, and the completion of the program.

This publication shows examples of Learning Management Systems used in Hungarian higher education. Summarizing and systematizing expectations and demands expressed in connection with learning management systems, the present work tries to help the reader orientate on an ever-expanding market.

Key words and phrases: e-learning, distance learning, Learning Management System, higher education.

ZDM Subject Classification:

Introduction

The fast development of Information Technology, the sudden increase in the number of computers, the appearance of computer networks, the easy access to the Internet have all given a fresh impulse to all forms of education recently.

It was just a few years ago that Miklós Havass gave a presentation on the “Changing paradigms in higher education” at a conference “Informatics in higher education ’99” in Debrecen. Then, he enlisted all those social factors that determine the system of education, among them, the paradigms of higher education, which have dramatically changed in the recent years. In short, these factors are the following: the socially determined **expectations** of our **age** for the result of education, the **structure of knowledge** created, maintained and to be passed on by the human race, **human communication**, the means and ways of conveying information, and the **teaching-learning techniques** mostly determined by the factors mentioned above.

The message of his lecture was that we are witness to see an evolving society with new quality requirements that will completely change the whole system of relations. Influencing each of the above-mentioned social factors, this will result in new paradigms in (higher) education [1].

In other words, we can find new answers to the questions that should be posed. **Who teaches whom? What is taught and how? What media are used and with what efficiency?**

I would like to give a short account of the changes these fundamental elements will undergo, which will enforce new answers to the challenges education must face.

In the world of globalisation people, the employees must meet **new and different requirements** they must have up-to-date, appropriate and useful knowledge in an ever-changing world of competition; besides, they must be able to continuously re-create themselves and adapt to lifelong learning.

The amount of knowledge accumulated by the mankind is **exponentially increasing**, while the structure of this knowledge is changing. More and more interdisciplines are formed. Technology is changing very fast, and its share in the structure of the knowledge is growing. The research of technology can be carried out only in well-equipped science parks, on teamwork basis, and in an internationally competitive way. Knowledge itself is not absolute any more, temporary character and continuous change have become integral parts of it.

Each new stage in the evolution of **communication** has brought about new techniques in getting access to and managing knowledge, as well as in the learning process itself. The present means of communication is the info-communication network based on digitalisation, which facilitates individual access to knowledge with the help of data banks spreading worldwide. This communication network

enables users to acquire knowledge independently of place and time. The application of multimedia helps the learning process by transmitting information through various media. Information networks and informatics applications may significantly change organization and management work of institutions, as well as the administrative work.

Miklós Havass outlined his vision of the future in the fields of education in 1999 as follows.

The educational system including higher education must meet the changing demands. It must prepare for a **change of the institutional role**. Institutions of higher education are gradually being transformed into workshops applying modern business management, marketing, and co-operation techniques, which imply that external autonomy should be given up. Traditional modern universities, – dating back to 1810, when the University of Berlin was established based on the ideals of Humboldt – are continuously becoming the “universities of post-modernity or the global world”. The main criterion for universities will be the efficiency of transmission of usable knowledge.

The West Committee, made a prognosis in 1997 [2] about the transformation of the institutions of higher education. It suggests that as a result of an efficiency-based selection the **following types of institutions of higher education will be developed**:

- low-cost universities providing work force for the labour market,
- web-universities for the middle-class people of underdeveloped countries,
- universities training specialists that will probably play the role of leading research universities as well.

In addition, the international industry of university course material suppliers will be developed

- testing and assessment institutes,
- courseware developers,
- course material developers,
- and the web-universities based on them, as well as the network of those who offer special training.

The roles of the teacher are also undergoing a change. The personality of the teacher is not a lifelong model any more. The teacher-student relationship is transforming into one between the service provider and the client, based on a contract, instead of the model-supplier and model-recipient relationship based on authority.

New roles of the teacher are emerging:

- the ‘navigator’, who guides and orientates the students (maybe individual students, communicates with them on the web) in a personalized learning process,
- the course material editor, developer,
- the ‘tutor’, who serves as a personal model, and is a source of motivation and intuitive research at universities,
- and the star-teacher (modelled on media stars), independent of universities, who occasionally gives impressive and comprehensive presentations for a big audience.

The knowledge to be transferred to the students must provide a global overview, the ability to conform to changes, the ability to renew; at the same time, it must be exact, specialised and easily applicable knowledge. The time spent in education extends, credits and diplomas are not seen as definite. Course books and libraries are replaced by networks and their renewing databases. The learning process is becoming open, hypermedial, instead of linear.

The West Committee report, the presentation by Miklós Havass outlined a vision of the expected future.

Today, we can experience these trends as a daily reality. Institutions of higher education must meet the learning demands of the large number of students who apply for different-level diplomas. Recognizing the new opportunities it is our task to take advantage of them, so that Hungarian higher education can better and more efficiently meet the demands of the contemporary society, while, trying to save the values of the traditional educational system.

1. Computers in education, e-learning

Computers, computer science, and informatics play a dual role in education: they are the subjects and the tools of education. Higher education offers students an extremely wide range of subjects in computer science and informatics. At the same time, computers, informatics, and IT have an ever-increasing role in the establishment and spread of new educational forms and methods.

The role of distance learning is increasing in this world of computer networks, because of a widespread access to the net and a growing demand for learning beside work. Learning has become independent of place and time. The use of

Internet, e-mail, chat, newsgroup, or video conference as means of communication is growing compared to personal meetings, correspondence, or phoning.

Using computers offers new methods of recording course materials in an extremely effective way:

- the parallel use in education of different media and other services provided by the computer will open up new opportunities not to be foreseen in improving student motivation, the quality of demonstration and learning efficiency,
- the degree of interaction guarantees so far unthinkable flexibility in learning, it increases the efficiency of acquisition, and opens up new ways to the regulation and support of individual learning of the course material.

Networks enable

- fast and cheap transmission of teaching materials and the information necessary for education to the student,
- involving distant computer resources in students' education and practical training,
- creating new means of communication in the teacher-student and the student-student relations in addition to the conventional means of telecommunication. Depending on the applied technology, these means can range from e-mail to the interactive distant conference. The aim of use can be imparting knowledge, tutoring, consultation, testing the results of learning, exchange of information between students, co-operation to solve tasks etc.

Besides, informatics can efficiently be used in the organization and implementation of open and distance learning programmes, conducting educational needs analysis, advertising courses, keeping contact with students etc. [3].

The possible educational applications of up-to-date information technology is well illustrated in Chart 1 [4], where **e-learning** as a new educational model is in the centre and it comprises the characteristic features of Computer Based Learning, Web Based Learning and Distance Learning.

The notion of e-learning will be used as defined here, which is an adequate interpretation of the graph above. Accordingly, *e-learning is an open form of education accessible on a computer network – independently of place and time –, which by organizing the teaching-learning process, and relying on effective and optimal teaching and learning methods integrates the teaching material, the student resources, the tutor-student communication, as well as the interactive teaching software into a unified management system, and makes it available for the student* [5].

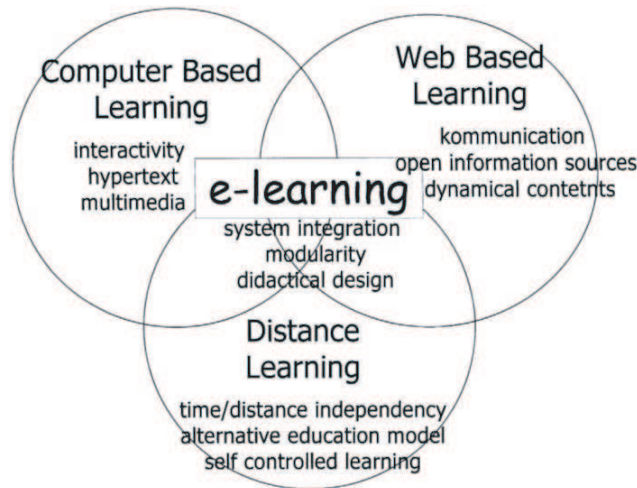


Chart 1

Accepting this interpretation, the technological elements of e-Learning can be defined as follows:

- Learning Management System. This is the software package that creates the structure of the whole educational process: course organisation, course material presentation, tracking student work, recording results, and the completion of the program.
- Authoring system that enables teachers to prepare reusable teaching modules, which can be used to compile adequate course materials. The authoring software may have set-in test designing application.
- Course material that contains the knowledge to be acquired.
- Browser. The LMS modules, including the course material, can be accessed by the user with a browser.

The subject of this publication is learning management systems, which is the first in the list above. Summarizing and systematizing expectations and demands expressed in connection with learning management systems, the present work tries to help the reader orientate in an ever-expanding market.

2. Learning management systems

2.1. An overview of the management systems

LMSS are informatics systems that automate educational processes. These systems provide the modern, virtual space for the e-learning educational process. They also guarantee that all participants can use the services available for them independently of place and time.

The LMSS basically provide the following services for users:

- organization mapping,
- managing users and fields of activity,
- managing and serving e-learning course materials,
- mentoring or tutoring possibilities,
- communication possibilities.

There is a wide range of LMSS in the market. This diversity is mainly due to the fact that these systems can vary in numerous features, principally in their functions. The services listed above can be weighed differently in different LMSS (some may even be omitted). The way of realization of the functions may also differ significantly. It has different reasons. One of them is that they were developed for different environments and purposes, in order to meet the different needs of those devising and organizing e-learning education.

There are LMSS, which were developed for the environment of big decentralized companies, with the aim of supporting the training, or further training of employees working in different sites and structures of the company. In these systems, the mapping of the organizational structure, competence management and close co-operation with other information systems (ERP, CRM) of the company is highly emphasized. (One example for this kind of LMSS is Oracle iLearning. In Hungary it is used at Inter-Európa Bank Rt., K&H Bank Rt., T-Mobil Communications Rt. The other example is that Hewlett-Packard offers virtual education environment through “E-learning-on-Tap” for further training of their own employees or employees of other big companies or firms.)

With other LMSS content servicing is more emphatic. These systems are also referred to as Content Library Solutions. (“Sulinet Digital Knowledge Base” (SDT) is being developed for the purposes of Hungarian secondary education. It is a framework system with the objective of providing – among others – an overall database of the entire body of teaching materials in public education, and making it accessible for the participants of public education through the web.)

In certain systems LMS content servicing function is combined with a major feature of producing and managing content. A part of these systems belongs to the so-called LCMS category. (One example is TopClass from WBT Systems.)

LMS systems can be found today in various forms of vocational training and further training alike. (For example “Financial Audit education program” is being developed on e-learning platform using of SABEDU Knowledge Linker LMS.)

Those Learning Management Systems that were developed first of all to satisfy the demands of education institutions, are worth mentioning as a separate category. The diversity of the institutions – their missions, goals, technical infrastructures and wide variety of users – demands that e-learning technology provide the highest level of flexibility to meet their needs. (One example is WebCT).

First, I would like to describe the criteria and the features that characterize an LMS. Then, I am going to focus on those features that have a priority in higher education. Finally, let us try to find some points to make the right choice easier.

2.2. The criteria of describing learning management systems

In May of 2003, `brandon-hall.com` published a document titled “LMS 2003: Comparison of Enterprise Learning Management Systems”, which contains the analysis of 70 LMSS [6].

This paper gives a profile of each system in a uniform structure, which makes it possible to compare the different systems. Studying the “Complimentary executive summary and sample profile” at

<http://www.brandonhall.com/public/publications/LMS2003/lms2003.htm>, the reader will find experts’ aspects of analysis, and the analysed features of the different questions. This analysis of about 100 questions in 15 categories gives great help in mapping the features of LMSS available, and in finding the relevant questions in order to make the right choice of an LMS.

The EduTools project of WCET (Western Cooperative for Educational Telecommunications) found at

<http://www.edutools.info/course>

was specially prepared for the sphere of higher education. It offers an analysis and comparison of so-called Course Management Systems. The Course Management Systems web site gives an overview of 63 actual products in 42 features, with the examined criteria placed in 7 categories. The analysed products, the aspects of the analysis, and individual products’ conformity with the different aspects can be seen in the, “Compare All Products by All Features” summary table [7].

In the following chapter, by interpreting, examining and using some of the questions and criteria of the analyses mentioned above, I would like to answer the question: how to choose from the products available for higher education in Hungary.

2.3. How to choose?

When choosing a software product, just like in the case of buying any commodity, one has to answer several questions before making a decision. Perhaps, we face too many questions and we cannot examine all of them at the same time. Moreover, they should be weighed differently for decision-making. However, if we know a filtering method, we can narrow down the range of products step-by-step.

One possible method could be the identification of individual aspects of examination, each one being regarded as one step. At each step or stage, a range of questions concerning the examined system must be put. At the following stage, only those systems are considered which have satisfactorily met our requirements at the previous one. It means that at one stage, particularly at the stage of functions, products need not necessarily have all examined features. It is also possible to weigh different features, i.e. features can be scored according to their importance for us. On the basis of the total score, products can be further examined at the next stage. What should these stages be?

2.3.1. Technical specifications (hardware/software)

When an institution wants to buy LMS or a Course Manager Software, it is important to know what infrastructure it needs to operate. In other words, it is necessary to compare the type, the configuration and the operating system of our present infrastructure or computers we plan to install in the future with the hardware and operating system needs of the examined programme product. When we use applications supporting e-learning, client computers and the necessary applications should also be considered.

The management systems are always network applications, and they are used in Internet/intranet environment.

On the Internet, management systems function in a client-server mode. It means that the application is running on central server(s) and all essential tasks are concentrated here. Users can access to the system by using a browser (Netscape Navigator, Internet Explorer). The browser shows the information in a

structure determined by the server. It also provides interactive connection, and gives reports to the server.

However, contents are usually run by using the resource of the client PC only. The server provides the teaching material available for the user. Afterwards, through a standard socket the server is informed only the kind of data, such as the time when the teaching material started to run, how long that lasted, where the student finished, or whether an exam was taken, and what result has been achieved, etc.

The informatics infrastructure of management systems – including the number of servers, the definition of each server’s function in case there are several servers – is influenced by different factors, such as the number of users, geographical division, or the resource need of contents.

Some management systems belong to the one-server systems. In this case, the management system application itself is run by the web server, which is the basis of management systems. Also, this is where student data, teaching material, and the databases with all the data necessary for the operation of the system can be found.

With larger systems, or those in need of big resources, the different functions are managed by dedicated servers. In this case, the web server and the databases server are separated, and they might have a media server, in addition. The web server co-ordinates the work of different servers. Certain elements of the server architecture might even be multiplied to adapt to the geographical division. The duplicated elements automatically co-ordinate the operation.

Regarding the technological background it is a possible solution for the institution to rely on hosted services. The application of hosted services means that the product provider offers the course management system on a server at its location so the institution does not provide any hardware. An important aspect of hosted services is that the product provider takes responsibility for all technical support and maintenance of the server, as well as the actual web service of providing online courses.

2.3.2. Interoperability

Generally information systems do not function in an isolated environment within a single institution, but they have to co-operate with other information systems while exporting, importing, or synchronising data.

In Hungary, where e-learning exists parallel, or complementing traditional classroom education, it is a crucial criterion whether the chosen management

system is compatible with the student information system (currently it is Neptun, or ETR) adopted by the institution. Communication and group work among students; monitoring student activity and progress, etc. by teachers play an important role.

The management systems are based on databases. On the one hand, it results in the efficient storage of data (basic data, educational materials), which guarantees their multi-purpose use independently of application. On the other hand, the countless different interfaces and connection possibilities ensures that the management system can be used in various kinds of environment, and for multiple purposes.

An extremely important characteristic of these management systems is how they can manage different contents coming from outside. The co-operation capability of an LMS implementation designed for the long run is measured by how they can meet open software industry, and major e-learning standards.

Instructional standards compliance concerns how well a product conforms to standards for sharing instructional materials with other online learning systems and other factors that may affect the decision whether to switch from this product to another. Instructional Standards Compliance involves trying to make it possible for applications from different product producers to work well together. There are presently several proposed standards but the most prominent are the standards developed by the IMS Global Learning Consortium that define the technical specifications for interoperability of applications and services in distributed learning and support [8]. The SCORM standards-in-progress integrate the industry specifications from IMS, AICC, IEEE, and ADRIANE and are operational standards with corresponding compliance test suites for learning objects [9].

2.3.3. Functionality

We examine here whether a system is capable of doing what the user needs. In the case of an e-learning, or education management system, functionality is concerned with the existence and operation of different tools and services. These [7] go into two major groups: Learner tools and Support tools. These groups comprise the following features.

Synchronous and asynchronous communication possibilities

- Discussion forums are online tools that capture the exchange of messages over time, sometimes over a period of days, weeks, or even months. Threaded discussion forums are organized into categories so that the exchange of messages and responses are grouped together and are easy to find.

- File exchange tools allow learners to upload files from their local computers and share these files with instructors or other students in an online course. Note: File attachments to messages are part of Internal Email and Discussion Forums.
- Internal email is electronic mail that can be read or sent from inside an online course.
- Online Journal/Notes enable students to make notes in a personal or private journal. Students can share personal journal entries with their instructor or other students but cannot share private journal entries.
- Chat is a conversation between people over the Internet that involves exchanging messages back and forth at virtually the same time.
- Video services enable instructors to either stream video from within the system, or else enable video conferencing, either between instructors and students or between students.
- Whiteboard tools include an electronic version of a dry-erase board used by instructors and learners in a virtual classroom (also called a smartboard or electronic whiteboard) and other synchronous services such as application sharing, group browsing, and voice chat.

Productivity tools

- Bookmarks allow students to easily return to important pages within their course or outside their course on the web. In some cases, bookmarks are for an individual student's private use, and in others can be shared with an instructor or amongst an entire class. Some systems also allow bookmarks to be annotated.
- Calendar/Progress Review tools enable students to document their plans for a course and the associated assignments in a course. An online calendar is one of the tools most products use for Calendar/Progress Review.
- Orientation/Help tools are designed to help students learn how to use the course management system. Typically, these tools are self-paced tutorials, user manuals, and email or telephone helpdesk support.
- Searching within a course is a tool that allows users to find course material based on key words.
- Work offline means that students can download course content to their local computers or sometimes they access content on a CD-ROM. Sometimes course material is in printed form as well.

- Synchronize means the ability to return students to the location in their course where they were working the last time they logged off.

Student involvement tools

- Group Work is the capacity to organize a class into groups and provide group work space that enables the instructor to assign specific tasks or projects.
- Self-assessment tools allow students to take practice or review tests online. These assessments do not count toward a grade.
- Student Community Building tools allow students to create study groups, clubs, or collaborative teams.
- Student Portfolios are areas where students can showcase their work in a course, display their personal photo, and list demographic information.

Administration tools

- Authentication is a procedure that works like a lock and key by providing access to software by a user who enters the appropriate user name (login) and password. Authentication also refers to the procedure by which user names and passwords are created and maintained.
- Course authorization tools are used to assign specific access privileges to course content and tools based on specific user roles, for example students, instructors, teaching assistants. For example, students can view pages and instructors can author pages.
- Registration tools are used to add students to and drop students from an online course. Administrators and/or instructors use registration tools but students also use them when self-registration is available. Students can also be added to or dropped from an online course through integration of the course management system with a Student Information System.

Course delivery tools

- Automated Testing and Scoring tools allow instructors to create, administer, and score objective tests. The students' tests and their evaluation can be appropriate both for self-control and for appraisal of students' knowledge in an exam situation. However we must not forget the fact that merely the login name and the password of the students cannot guarantee that the required person will sit for the distance examination. Therefore running the exam modules in practice is recommended in the presence of the examiner and the examinee and/or under controlled conditions.

- Course management tools allow instructors to control the progression of an online class through the course material.
- Online grading tools help instructors mark, provide feedback on student work, manage a gradebook.
- Student tracking is the ability to track the usage of course materials by students, and to perform additional analysis and reporting both of aggregate and individual usage.

Curriculum design

- Accessibility compliance means meeting the standards that allow people with disabilities to access information online. For example, the blind use a device called a screen reader to read the screen but Web pages need to be designed so that screen readers can read them.
- Content sharing/reuse enables specific content created for one course to be conveniently shared with another instructor teaching a different course perhaps even at a different institution. Sometimes the content is in the form of learning objects.
- Course templates are tools that help instructors create the initial structure for an online course.
- Curriculum management provides students with customized programs or activities based on prerequisites, prior work, or results of testing.
- Customized look and feel is the ability to change the graphics and how a course looks. This also includes the ability to institutionally brand courses.
- Instructional design tools help instructors creating learning sequences, for example, with lesson templates or wizards.

2.3.4. Documentation

The applicability of software products largely influenced by the quality of documents attached to them. These documents – occasionally presented on different media – are very helpful for installation, they provide instructions on the application of the software, even separately for different user groups. They describe different application opportunities offered by the software and provide support in eliminating errors.

2.3.5. Customer support and services

It means support and services provided by the vendor. For example:

- Instructor Helpdesk tools help faculty members use the course management software. These tools typically include telephone contact with the helpdesk of the product provider.
- E-mail support is an off-line technical assistance that helps to use the system.
- The product provider or a third external partner may offer educational service in connection with the usage.
- Conferences supporting the exchange of experience may be linked to the product.
- The supplier may offer assistance in content development projects connected to the product, or complete outsourcing content development services.
- While qualifying the system it is an important factor to examine its reliability and accessibility as well.

2.3.6. Costs

At a first glance, the prices of software are the easiest to compare. At the same time, one must remember that the price may have more components.

- Costs include start-up costs, ongoing costs and technical support costs and depend on number of licences. Start-up (installation) costs are the initial expenses involved in purchasing or using the software. Ongoing costs are the expenses for maintaining the software after the initial setup, such as upgrades and new versions of the software. Technical Support Costs are the expenses of purchasing software assistance from the vendor, e.g., help desk for users via email and/or phone, assistance with servers, networks, or interfacing with other software.
- Open Source means the software is delivered with the source code and the license agreement gives the licensee the right to modify and redistribute the software.
- Selecting the software and considering the costs we have to estimate the expenses the students have to pay for the education: that is the distribution of hardware, software, and management costs between the institution and the students.

On the one hand selecting software with an open source code can be cost-effective on the other hand it results in new responsibilities. Let us think of the

installation tasks, the adaptation to local needs, the operation tasks, ensuring the reliability of the operation, etc. This kind of solution is suggested only in case the professional background of developers is available and they are capable of performing the above mentioned tasks. Providing this condition requires financial resources.

2.4. Some example for learning management systems in the Hungarian higher education

The tables below summarises the features of some LMSs or Course Management Systems available in the higher education in Hungary, on the basis of the aspects listed above.

Product	EDUWEB	ILIAS	Intralearn	Moodle	Nettutor
Technical platform (hardware/software)					
Unix server	+	-	-	+	-
Windows server	+	+	+	+	+
Other servers	Linux	-	-	Linux	-
Database requirements	MySQL, PostgreSQL	MS SQL	MS SQL	MySQL, PostgreSQL	MS SQL
Client software required	Browser	Browser	Browser	Browser	Browser
System is locally installed or/and hosted services available	Both	Locally	Both	Locally	Locally
Interoperability					
Neptun/ETR	It needs some development	ETR	ETR	-	Directly not
Language support	Hungarian (translation into other languages is supported)	English, but translation into Hungarian is supported	Hungarian	English, but translation into Hungarian is supported	Hungarian
Instructional standards compliance	-	SCORM, LRN	SCORM	-	-

Table 1.

Product	EDUWEB	ILIAS	Intralearn	Moodle	Nettutor
Functionality					
Discussion forums	+	+	+	+	+
File exchange	–		+	Between instructors and students	–
Internal e-mail	+	+	+	–	–
Online journal/notes	Personal messages via internal e-mail others in forums	+	+	Between instructors and students	–
Chat	Own chat server	+	+	+	–
Video services	+		+	–	–
Whiteboard	–	–	With file exchange	–	–
Bookmarks	–	+	+	–	–
Calendar/progress review	–		+	Instructor makes plan for students	–
Orientation/help	+	+	+	–	+
Searching within course	–	+	+	In forums	–
Work offline	Materials are available on CD-ROM as well	+	–	Course materials are downloadable	+
Synchronize	–			–	–
Group work	–	+	+	+	–
Self-assessment	+	+	+	+	+
Student community building	–		+	–	–
Student portfolios	+	–	In forum	+	–
Authentication	+	+	+	+	+
Course authorization	+	+	+	User roles and their rights are built in	User roles and their rights are built in

Table 1. (continued)

Product	EDUWEB	ILIAS	Intralearn	Moodle	Nettutor
Functionality					
Registration integration (Self registration, batch registration, interoperability with other systems)	Self registration and batch registration available	Batch registration from ETR	Using ETR	Self registration available, administrator can register as well	Administrator can register students
Automated testing and scoring	+	+	+	+	+
Course management	+		+	+	-
Online grading tools			+	+	-
Student tracking	+	+	+	There is no aggregate usage reporting possibility	+
Accessibility compliance	-	-	-	-	-
Content sharing/reuse	By content manager		+	Materials in separate files are reusable, but aren't stored in a digital repository	-
Course templates	For course materials	-	+	+	-
Curriculum management	Via personnel communication or help of tutor	-		-	-
Customized look and feel	+	+	+	-	-
Instructional design tools	Eduweb TanSzer	+	+	Minimal	-

Table 1. (continued)

Product	EDUWEB	ILIAS	Intralearn	Moodle	Nettutor
Documentation					
Installation guide	Installation guide, maintenance guide, tutorial, user manual	Documentation can be downloaded from Internet	+	+	+
Getting started tutorial			+	-	-
User manual			+	+	+
Services / Support					
Instructor helpdesk	+	-	+	Moodle.org	+
E-mail support	+	-	+	+	+
Vendor offered training how to use the product	+	-	+	Based on contract	-
Product conference	-	+	-	-	-
Vendor supplies project mentoring services (help with development)	+	-	+	-	-
Vendor offers full outsourced courseware development services	+	-	-	-	-
Price / Licencing					
Costs		Free according to GPL		Free according to GPL	
Open source	-	+	-	+	-
Other					
Software version	3.3	3.0	3.0	1.1.1	1.0
Vendor in Hungary	Eduweb Távoktatási Rt.	Downloadable from Internet	IBCnet Hungary	Downloadable from moodle.org	Számalk Informatika Rt.

Table 1. (continued)

Product	EDUWEB	ILIAS	Intralearn	Moodle	Nettutor
Other					
References in Hungarian higher education	Eötvös Loránd University, Budapest University of Economic Sciences and Public Administration, BKE	Denis Gabor College, Budapest Technical College (inauguration in 2004)	Denis Gabor College, Budapest Technical College	Eötvös Lorand University Faculty of Science, Eötvös Loránd University Faculty of Informatics	Corvinus University of Budapest Faculty of Public Administration
Sources:	[20]	[19]	[17]	[10]	[16]

Table 1. (continued)

Product	Oracle iLearning	SYNEU Phoenix LMS	Qualitycator Qualitycator	WebCT	Web-katedra
Technical platform (hardware / software)					
Unix server	+	-	-	+	-
Windows server	+	+	+	+	+
Other servers	Linux	-	-	Linux, Tru64, Solaris, Aix	-
Database requirements	Oracle 9iR2	MS SQL 2000	MS SQL	Own Database	MS SQL
Client software required	Browser	Internet Explorer 6.0 Sp1	Browser	Browser, Java VM (for chat, whiteboard)	Browser
System is locally installed or/and hosted services available	Both	Both	Locally	Locally	Locally
Interoperability					
Nep-tun/ETR	It may need some development	It may need some development	-	Directly not	It can import data from Neptun but cannot export

Table 2.

Product	Oracle iLearning	SYNEDU Phoenix LMS	Qualitycator Qualitycator	WebCT	Web- katedra
Interoperability					
Language support	47 languages, inc. Hungarian	Hungarian, English, Slovak. Extendable, by translation without programming	Hungarian, English. (It can be translated into other languages easily.)	It has no Hungarian language support but the screen items can be translated	Hungarian
Instructional standards compliance	AICC, IMS, SCORM	It can display materials made on SCORM base	SCORM	IMS	–
Functionality					
Discussion forums	+	+	+	+	+
File exchange	–	–	–	In forums	–
Internal e-mail	+	From organizer to student	–	+	Between instructors and from instructors to students
Online journal/notes	Private notes with the integrated e-mail client	In forums	In forums	In forums	–
Chat	+	In case of installation of synchronous module	–	+	–
Video services	+	+	–	–	–
Whiteboard	–	–	–	+	–
Bookmarks	+	–	According to SCORM	+	–
Calendar/progress review	+	+	–	+	Plans and requirements attached to the subjects

Table 2. (continued)

Product	Oracle iLearning	SYNEDU Phoenix LMS	Qualitycator Qualitycator	WebCT	Web- katedra
Functionality					
Orienta- tion/help	+	+	-	+	+
Searching within course	+		-	+	-
Work offline	Course materials are down-loadable and available on CD as well	It is possible to make off-line material on CD-ROM	It is evolvable	Course content available in printed form as well	Course materials are down-loadable
Synchronize	In case of on-line work	-	According to SCORM	-	-
Group work	+	-	-	+	-
Self-as- sessment	+	+	Applying tests made on SCORM standards	+	+
Student community building	-	-	-	+	+
Student portfolios	-	-	-	Students can design own home pages	In forum
Authenti- cation	+	+	+	+	+
Course au- thorization	+	+	User roles and their rights are built in	User roles and their rights are built in	+
Registration integration (Self registration, batch registration, interoper- ability with other systems)	Self registration available	Self-registra- tion available or data import from SAP or other systems	Self registration and batch registration are available, but interoperability doesn't	With help of a self developed software from Neptun	From Neptun and inde- pendently from Neptun as well

Table 2. (continued)

Product	Oracle iLearning	SYNEDU Phoenix LMS	Qualitycator Qualitycator	WebCT	Web- katedra
Functionality					
Automated testing and scoring	+	+	Tests made according to SCORM can be imported	+	+
Course management	+	+	-		-
Online grading tools	+	Only with installed synchronous module	-	+	Yes, but the result isn't registered in Neptun
Student tracking	+	+	There is no aggregate usage reporting possibility	+	+
Accessibility compliance	-	-	-	-	-
Content sharing/reuse	+	+	-	+	-
Course templates	+	-	-	-	-
Curriculum management	+		+	-	-
Customized look and feel	+	+	-	+	-
Instructional design tools	-	+	-	-	-
Documentation					
Installation guide	Installation guide, on-line documentation, teaching materials, user manual	Installation guide, maintenance guide, user manual	+	+	-
Getting started tutorial			-	+	-
User manual			+	+	+
Services / Support					
Instructor helpdesk	+	+	+	+	+

Table 2. (continued)

Product	Oracle iLearning	SYNEDU Phoenix LMS	Qualitycator Qualitycator	WebCT	Web- katedra
Services / Support					
E-mail support	+	+	+	+	+
Vendor offered training how to use the product	+	+	+	-	+
Product conference	+	-	-	+	-
Vendor supplies project mentoring services (help with development)	-	Development of teaching material	-	-	+
Vendor offers full outsourced courseware development services	-	+	+	-	+
Price / Licencing					
Costs					
Open source	-	-	-	-	Partially
Other					
Software version	4.0	2.6	2.0	3.6	2.0
Vendor in Hungary	Oracle Hungary	Synergon Rt.	Számalk	Silicon Graphics	Nimda Bt.
References in Hungarian higher education	University of Debrecen English-American Institute, Miklós Zrínyi National Defence Univ.	Eötvös Loránd University Faculty of Science	Miklós Zrínyi National Defence University, St. Stephan University, Gödöllő (Pilot)	Eszterházy Károly College, Hungary, University of Miskolc	Pázmány Péter Catholic University Distance Learning Section
Sources:	[12]	[18]	[16]	[13]	[14]

Table 2. (continued)

Some additional information to software listed in the table above:

- Nettutor is a framework system developed in Hungary (the product of Számalk Informatika Rt.). It has been running for two years at the Faculty of Public Administration of Budapest Corvinus University serving approximately 400 students a term. Unfortunately the future development of the program is not expected.
- Qualitycator is a more advanced product of the same company. It was primarily designed to support training courses, although its parallel application in higher education has been introduced in two places. Some ideas about the first experiences can be read on the following website:

<http://www.zmne.hu/Forum/02ond/inkaprog.htm>.

Its development is continuous.

- Webkatedra is the development of the Hungarian Nimda Bt. At present, it has a single reference institution in higher education. The extension of its application in additional institutions would require further development. There is no survey available on the experience of application.
- EDUWEB was also developed in Hungary. It has several references in higher education. It has an important service in the form of a teaching material editing and managing system. Although its present version does not comply with e-learning standards, its development in this direction is expected.

Compliance with the standards is playing more and more important role in the world of e-learning. One of the objectives of the standards is to ensure the portability and reusability of the teaching materials.

- Synedu Phoenix LMS developed by Synergon is primarily meant for the management of e-learning courses, while it facilitates the organisation of traditional classroom education or hybrid training alike. The mentioned reference in higher education is connected to a project called UNESCO Virtual Academy carried out in 2002.
- Moodle is of an open source code, with one Hungarian development at the denoted reference place. It is used there to supplement the traditional classroom based education. Its application presupposes the presence of a development team.
- ILIAS is also an LMS with an open source code, which is being introduced in Denis Gabor College. A survey is being made here to analyse the student feed-back. The results are promising, but the amount of samples available at the moment is not sufficient enough to draw conclusions.

- Oracle iLearning was primarily designed for the purposes of in-company e-learning training. (258 companies and institutions can be found among its users on the international market.) There is one existing Hungarian application in higher education, but examining new possibilities of its introduction is under way. It is a dynamically developing system adjusted to the standards.
- “WebCT is the world’s leading provider of e-learning systems for educational institutions” [21]. In Hungary it is used for the organisation of a complete training programme – information specialist-librarian – in the form of distance education. It is important to point out here that at EKTF great emphasis is laid on the examination of the quality management of distance education systems as well as the evaluation of e-learning courses, teaching materials and services. A detailed summary of the topic see in publication [5].

Some additional LMS, LCMS systems in Hungarian market and their references in higher education

Vendor/Supplier	Product name	References
Biodigit Kft.	Lapoda Education	University of Pécs (under testing)
IBM	IBM Lotus Workplace Collaborative Learning	University of Debrecen, University of Miskolc, University of Pécs (all of them in the strategic planning, configuration, installation phases)
Konzorcia Kft.	Distance Learning System (TOK)	University of Pécs Pollack Mihály Technical Faculty, University of Veszprém (pilot project), Szent István Egyetem Gazdaságtudományi Kar – (pilot project)
Mimóza Kft.	COEDU [15]	Miskolc University (under testing)
MT-System Kft.	EDUSYSTEM [11]	Eötvös Loránd University Pedagogical Department

3. Summary

Nowadays e-learning, as a new form of education and learning, is getting an increasingly important role. Its realisation presupposes the organised cooperation between several factors, such as infrastructural background, content development and the management of the services and the trainings.

Present study is providing a comprehensive summary of the E-learning Management Systems operating in Hungarian higher education while offering a set of considerations and an approach to facilitate the preparation of decision-making of users working under various conditions and having different needs.

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