

## OPEN SOURCE LEARNING MANAGEMENT SYSTEMS IN DISTANCE LEARNING

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### ABSTRACT

This paper presents the major findings from evaluation the most widely used open source learning management systems and identify the most suitable open source e-learning platform. In this study, some analyses and comparisons were made about open source learning management systems the outcome of which was that Moodle was found to be outstanding with many features more than other LMS since it aims to improve the educational quality and include the tools that an e-learning system should have.

**Keywords:** Moodle, open source LMS, learning management system, distance learning, open source software

### INTRODUCTION

In the last decade, the effect of Internet usage in education has increased gradually and new technologies have improved students' learning. The tremendous improvements in information and communication technologies and increase in the use of internet brought lots of opportunities to different fields and especially to Instructional Technologies. Based on these new technologies, learning environments are able to provide a wide range of educational alternatives for learners. Distance learning is one of these alternatives which became attractive where students and instructors are physically in different locations and time (Ozkul, 2003). By using distance learning tools, their education can be more flexible with respect to place and time constraints. Thus, students can access information any time and anyplace, such as either in libraries or during lectures.

As is widely known, distance learning is costly, and cost-effectiveness becomes more important as the institutions become large-scale providers of distance education. In relation to this, Miller R.L (1990) states that, more and more educational institutions and companies are adopting distance learning methods to train and develop their employees because it delivers more training to a wide range of people for the least cost. What is more, studies show that, it is also effective through including e-learning tools, which reduce the learning time requirements by an average of 50 percent (Miller, 1990) and the retention rate of trainees is greater with e-Learning rather than a solely classroom based model (Miller, 1990). Throughout the distance learning process, Learning Management Systems (LMS) also known as the Virtual Learning Environments (VLE) or Learning Platforms have a significant role. Hall (2003) defines an LMS as: "software that automates the administration of training events. All Learning Management Systems manage the log-in of registered users, manage course catalogs, record data from learners, and provide reports to management." The definitions of LMS systems and related terms encountered in this article are discussed in further detail in the Paulsen, (2002).

In many organizations LMSs are being used to support and improve learning. According to Observatory on Borderless Higher Education (2002), some higher education institutions continue to develop in-house systems or buy into open source alternatives, but an ever-larger majority is purchasing licenses for proprietary platforms. In another study that supports the results of Observatory on Borderless Higher Education (Paulsen 2003) shows that, many institutions find it quite easy to start with a commercial LMS, but they face many problems such as; linguistic, assessment tools, suitability to target groups and pricing. However, open source LMS may have an impact on the future of the LMS market with its cost effectiveness and advanced features.

### Open Source Software

In a distance learning process, open source software can be used in many different phases such as application software that performs learning content preparation and in LMS which provides learning content presentation in a web based environment and as web server software (APACHE e.g.).

Due to the advantages of distance learning, schools and companies are adopting these new learning technologies and increasing their investments in it. However, along with the advantages, installation and support costs appear to be big disadvantages compared to a traditional learning environment. These disadvantages can be reduced to a great extent by the use of open source software which provides further gains. OpenOffice, StarOffice, KDE

Office, GNU Office software, which are under open source content authoring tools, are among the most widely used content preparation tools.

Statistical studies show that open source web server software is again found mostly preferred and widely used in learning content presentation in a web based environment such as (Netcraft Survey, 2008). Figure 1 shows that open source application and web server software are used in an open source e-learning system.

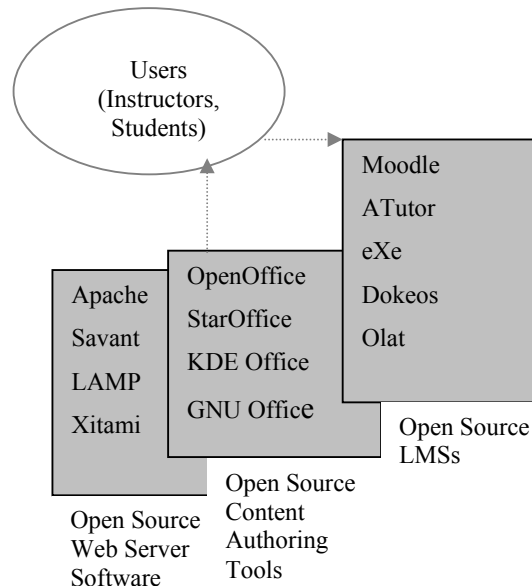


Figure 1. Open Source Application and Web Server Software

#### Advantages of Open Source Software

Most debated advantages and disadvantages of open source (OSC) software are; total cost, other financial and forensic subjects (Okmen, 2008).

Advantages of using OSC software can be summarized as follows (Okmen, 2008):

There is no single feature on which the future of the software depends: Open source architecture enables the user to take away the software company dependency risk that originated the code chosen to stop development and increase maintenance and development fees.

#### **Confidence:**

Popular OSC software is examined by many developers and software experts so; it is filtered and cleaned of errors. In this way, with the increase in quality, the fundamental aim of software production and the process of usage, Users confidence in the software increases.

#### **Sensitivity and flexibility for User Requirements:**

OSC software is often updated more frequently than proprietary software. Most of the time, these changes reflect the needs of the user and the developer community.

#### **The Support of Innovation:**

The Production process of OSC software is improved by a broader range of diverse and creative ideas. In this way, each developer has equal rights to reflect his own innovative thoughts to the product.

#### **Security:**

OSC software provides security according to the level of user requirements but usually not at the level of commercial software. Users with commercial software do not have access to the underlying contents of the code, so they do not have a definite knowledge of their security.

In a study of Computer Science Corporation (CSC), total cost of ownership has been defined after the comparison between OSC software and proprietary software as follows (Republic of Turkey State Planning Organisation, 2005):

- Hardware costs (contains purchasing cost and maintenance).
- Direct software costs (contains purchasing cost, support and maintenance).
- Indirect software costs (especially license management).
- Personnel costs.

- Supporting costs.
- Breakdown period costs.

### **Requirements for Learning Management System in an E-Learning Process**

A learning management system is defined as software that has been used in a learning content presentation which has a significant role and complexity in e-learning environment. An advanced e-learning system has to comply with the following requirements (Kis, 2007; Kritikou, P. Demestichas, Adamopoulou, K. Demestichas, Theologou&Paradia, 2008):

- Compatibility and the ability to work with other LMS.
- Content management ability such as Electronic filing and file management,
- How the learning content is created and managed as a “learning object”,
- Reusability of the content (Content compatibility like Scorm, AICC, IMS),
- Rapid content creation, distribution, integration and authorizing tools,
- Support for the tools using in content creation such as (Dreamweaver, Flash, Word, PowerPoint ),
- Performance and extendibility of the environment,
- Multi-Language Support

In the light of the features mentioned above, when these headings are analyzed in detail, as shown in tables below, the analysis shows that the success rate and the rate of wide-spread usage goes up in similar order to the number of these features included in the LMS,. These features can be listed as follows:

- Creating content in different input format (Scorm, IMS Content Package, MPEg file, Office file, JavaScript, PHP),
- Including tools for content development and management of content installation (Modular Structure),
- Database support,
- Advanced search and header hiding ability,
- XML support to work with different systems,
- Compatibility with industrial standards (AICC and SCORM e.g.),
- Video Conferencing support,
- Exam module, Online exam (test based question preparation),
- Student education process prosecution,
- Multiple language support,
- Calendar,
- Backup support,
- Chat tool,
- Whiteboard,
- Group work, debate forums,
- Ease of system installation,
- Survey adding,
- System requirements (the less the requirements are the easier it is to set-up).

### **Methodology**

Comparisons of open source LMSs were conducted for this study. In particular, the purpose of these comparisons is two-faceted. One is to analyze general features of open source LMSs considering the requirements of an LMS in an e-learning process. The other purpose is to conduct comparisons of these features among the mostly preferred four LMSs.

### **Instruments**

Qualitative research technique for data collection was employed. Comparative and contrastive observational approach was the method for this regard. The mostly preferred four LMSs are selected among from fifty free and open source LMSs on the web site of UNESCO (Website of United Nations Educational, Scientific, and Cultural Organization, 2008).

### **Data Analysis**

The selected LMSs are analyzed according to the requirements of an LMS in an e-learning process mentioned above. The features of three LMS's (have been analyzed by using the full access versions reached from their web sites and a detailed analysis carried out by creating courses on each LMS. Each feature is divided into sub-categories including:

- General aspects
- Didactic functionality
- Productivity tools
- Communication tools
- Technical flexibility
- Usability are analysed in details. For each criterion a check-list of the aspects observed and each overall criterion is presented with a brief discussion by using summary tables. Taking the advantages of the trials on usage in different projects has been used to prepare the following table for one LMS only.

## RESULTS AND DISCUSSION

In this part a comparative and contrastive study of LMSs are visualized according to their features and the results of the process are set out in summarized tables of comparisons. In Table 1, it can be analyzed that all LMSs have sufficient support and compatibility to standards.

Table 1: General Aspects

	<b>OPEN SOURCE LEARNING MANAGEMENT SYSTEM</b>	<b>MOODLE</b>	<b>ATutor [6]</b>	<b>DOKEOS [7, 8]</b>	<b>OLAT [9]</b>
<b>GENERAL ASPECTS</b>	<b>Support and Compatibility to Standards (AICC, SCORM)</b>	Scorm and IMS Content Package support.	Scorm and IMS Content Package support	Scorm and IMS Content Package support and the ability to import different LMS courses that are in Scorm Format.	Scorm, IMS Content Package and QTI support
	<b>Including content development and content authoring / editing tools, modularity.</b>	There is Html based content editor. Course pages can be edited as Html pages and new applications can be added as a module.	There is Html based content editor. Does not have a modular structure.	There is Html based content editor. Does not have a modular structure.	There is Html based content editor. Does not have a modular structure.
	<b>Backup Tools</b>	System can get backup automatically in required time and date. Every module can be backed up separately.	All course content can be backed up manually. Modules can not be backed up separately.	All course content can be backed up manually. Modules can not be backed up separately.	All course content can be backed up manually. Modules can not be backed up separately.
	<b>User Authentication</b>	Rather than its own database, the data can be held in different servers such as; LDAP, IMAP...	User passwords held in its database.	User passwords held in its database.	User passwords held in its database.

When the items are analyzed under General Aspects, Moodle is the only LMS which has wider options with different access possibilities, modular structure, and advanced backup tools.

Table 2: Didactic Functionality

	<b>OPEN SOURCE LEARNING MANAGEMENT SYSTEM</b>	<b>MOODLE</b>	<b>ATutor</b>	<b>DOKEOS</b>	<b>OLAT</b>
<b>DIDACTIC FUNCTIONALITY</b>	<b>The follow-up of student's learning processes</b>	Visited links, contents, sources and all activities done by visitors can be seen with date details.	Visited links and content usage by user can be seen statistically.	Visited links and content usage by user can be seen statistically.	Visited links, contents, sources and all activities done by visitors can be seen with date details
	<b>Online Exam</b>	10 different types question support. Exams can be prepared according to time, date and duration constraints.  Includes "Secure window" option for exams.	8 different types question supports Exams can be prepared according to time, date and duration constraints. Does not exist	6 different types question supports Exams can not be prepared according to time, date and duration constraints.  Does not exist	4 different types question supports Exams can not be prepared according to time, date and duration constraints.  Does not exist
	<b>Multiple Input Supports (Multimedia etc.)</b>	There is Scorm, IMS Content Package, mpeg, mov, mp3, flash, Office file, JavaScript based content support.	There is Scorm, IMS Content Package, Office file, mpeg, mov, mp3, flash support.	There is Scorm, Office file, IMS Content Package, mpeg, flash support.	No Multimedia support.
	<b>Video Conference Support</b>	Exists. Also holds "White Board" application. (For Moodle version 1.6 and upper WiziQ live Class Module exists)	Does not exist	100 users can connect at the same time and "White Board" application does not exist (Not Free).	Does not exist

In Table 2, the LMSs are analyzed according to their didactic functionality. Comparisons show that, Moodle and OLAT have the ability to view full user logging and tracking and activity reports for each student are available with graphs and details about each module (last access, number of times read) as well as a detailed "story" of each student involvement including postings etc. on one page.

Moodle and ATUTOR have an advanced online exam module with time, date and duration constraints. As shown in Figure 2, with advanced exam and assessment modules, educators can create questions in many formats such as; Multiple-choice questions supporting single or multiple answers, Short Answer questions (words or phrases), True-False questions, Matching questions, Numerical questions (with permitted ranges), Embedded-answer questions (close style) with answers within passages of text. The answer to each question includes separate feedback.

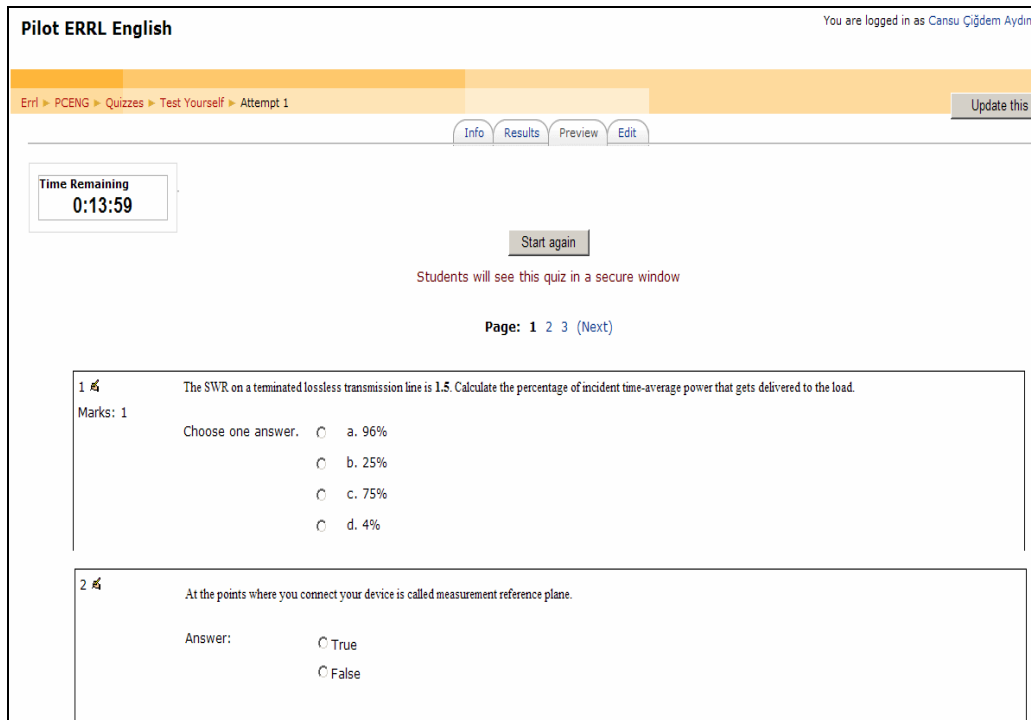


Figure 2. General Look of an Exam Module

The functionality of the multiple input supports in the LMSs adds a significant value especially to language teaching and it supports learning content variety for students having different learning styles.

When the support option of video conferencing is analyzed within the LMSs, only Moodle and Dokeos have the “video conferencing” support. By the use of video conferencing tool, virtual class application can be performed by using tools such as; online chat, file transferring (.pdf, .swf, .doc, .docx, .xls, .xlsx, .ppt, and .pps), white-board application, two side video and voice transfer on a specified date and time. A screenshot from mentioned application can be seen in Figure 3.

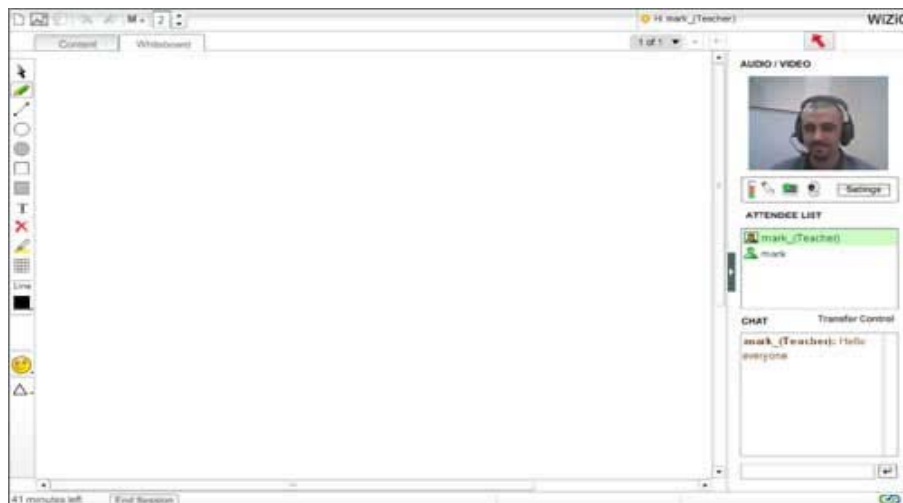


Figure 3 Video Conference and White Board Application Screen Shot

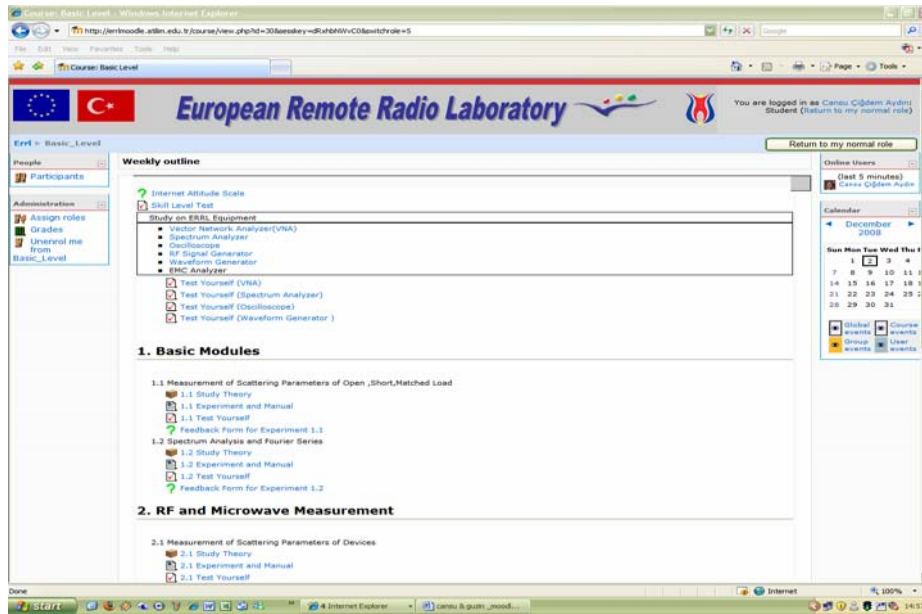


Figure 4. Weekly Course Schedule

Table 3: Productivity Tools

	OPEN SOURCE LEARNING MANAGEMENT SYSTEM	MOODLE	ATutor	DOKEOS	OLAT
<b>PRODUCTIVITY TOOLS</b>	<b>Online Help and Documentation</b>	Installation and maintenance documents can be reached from Moodle.org and different sites.	Not enough installation and maintenance documents	Includes only flash based installation and introduction documents on their home site.	Not enough installation and maintenance documents except their home site.
	<b>Calendar</b>	Course can be followed on calendar. Courses can be arranged weekly.	Does not exist	Does not exist	There is a calendar that can be used as agenda.

As a productivity tool, except for Moodle, the other LMSs do not have a sufficient online help and documentation files. In Moodle, the course can be followed from the calendar day by day and educators can put discussions and course activity on special dates where the system can check these dates and synchronize course dates according to the corporate calendar.

Table 4: Communication Tools

	OPEN SOURCE LEARNING MANAGEMENT SYSTEM	MOODLE	ATutor	DOKEOS	OLAT
<b>COMMUNICATION TOOLS</b>	<b>Survey and forum support</b>	Exists	Exists	Exists	Exists
	<b>CHAT and GROUP WORK</b>	Includes chat and group creating tools. Each user can work in his/her own group.	Includes chat and group creating tools. Doesn't exist	Includes chat and group creating tools. Doesn't exist	Includes chat and group creating tools. Doesn't exist

		Doesn't exist		exist	can be separated according to groups
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As a learning communication tool, Moodle LMS owns debate forums, file transfer, e-mail, calendar and white board and real time chatting options. In Moodle, students can also do research in discussion and debating forums.

Table 5: Technical Flexibility

	<b>OPEN SOURCE LEARNING MANAGEMENT SYSTEM</b>	<b>MOODLE</b>	<b>ATutor</b>	<b>DOKEOS</b>	<b>OLAT</b>
<b>TECHNICAL FLEXIBILITY</b>	<b>XML support</b>	Exists	Exists	Does not exist	Does not exist
	<b>System Requirements</b>	Apache, MySQL, PHP	Apache, MySQL, PHP	Apache, MySQL and PHP.	Java 1.5, Tomcat 5, MySQL 4.1, Apache 2.0 and OpenFire 3.3

XML support option in software adds a technical flexibility providing a basic syntax that can be used to share information between different kinds of applications. As shown in table 5 above, Moodle and Atutor have the XML support. When system requirements are analyzed, OLAT is the only LMS having a difficult installation process because of the program requirements.

Table 6: Usability

	<b>OPEN SOURCE LEARNING MANAGEMENT SYSTEM</b>	<b>MOODLE</b>	<b>ATutor</b>	<b>DOKEOS</b>	<b>OLAT</b>
<b>USABILITY</b>	<b>Multiple Language Support</b>	77 different foreign language supports.  Easy navigation between languages.	64 different foreign language supports  Not available	5 different foreign language supports (fully translated languages)  Not available	14 different foreign language supports  Not available
	<b>User Interface and ease of usage</b>	Extremely good. According to their profile, users can change their information and menus with a user interface that gives opportunity to design. Themes/skins allow for easy font/color/layout, etc. to suit local needs	Owens a good menu design.  Very sleek, easily modified by individual user (e.g., menu locations, icons vs. text, font, colors)	Owens a good menu design.	Owens a complicated menu design.
	<b>Frequency of Usage</b>	73.000 registered users	23,925 registered users	600 registered organizations	150 registered organizations



Language is an important issue having an impact on the selection and use of LMS systems according to Paulsen's data (Paulsen, 2003). With the 77 language support, and the numerical data in the frequency of usage as shown in Table 6 proves why Moodle is the most preferred open source LMS.

### CONCLUSION

In this study, open source LMSs were analyzed and it was observed that Moodle LMS among other LMSs, include many features that improve pedagogical quality and many needed tools that an e-learning system should have.

On the other hand, all three LMSs offer sufficient basic functions for their use as an LMS in an educational organization. However, Moodle appears to present a clear advantage practically in all the features compared. Briefly put, these are:

- (1) The modular design of the Moodle environment guarantees its flexibility: depending on the modules employed, it can lend support to any type of teaching style or educational mode.
- (2) A further asset resulting from its modular design and its greater attention to user interface is Moodle's superior rate of usability, compared with its competitors. In the case of the environment, the fact that it has a wider range of options does not make its use more complicated at all.
- (3) A wider range of user authentication options, ease of installation and maintenance in Moodle increase the frequency of usage.

All in all, it is possible to state that; due to the fast improvements of distance-learning, generalization of the use of open source software would provide the development of learning tools and educational quality. Also, the cost, which is the biggest advantage of e-learning rather than traditional learning environments, is removed by the use of open source e-learning tools.

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