

Open Source Learning Management Systems in E-Learning and Moodle

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Abstract—In the last decade, the effect of Internet usage in education has increased gradually and new technologies have improved student's learning. By using distance learning tools, the student education can be more flexible with respect to place and time constraints. So, students can access information in every time and everywhere either in libraries or during the lectures. As is widely known that, distance learning is costly, and cost-effectiveness becomes more important as the institutions become large-scale providers of distance education. Cost which is the most important disadvantages of distance learning according to traditional learning environments can be removed with the extensive features of the Open Source Software. Generalizing the usage of Open Source Software will provide development of learning tools and increases the educational quality. As far as the literature is reviewed, not much research has already been conducted about the comparisons of open source learning management systems in distance education. In this study, some analyses and comparisons were made about open source learning management systems and Moodle was outstanding with many features among other LMS that aims to improve the educational quality and include the tools that an e-learning system should have.

Keywords—component; Moodle, Open Source LMS, Learning Management System, Distance Learning

I. INTRODUCTION

The tremendous improvements in information and communication technologies and increase in the use of internet brought lots of opportunities to different fields and also Instructional Technologies. Based on the 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 student and instructor are physically in different location and time [9].

In relation Miller R.L states that, more and more educational institution and companies are adopting distance learning methods to train and develop their employees, because it delivers more training to wide range of people for the fewest cost [5]. What is more, studies show that, it is also effective through including e-learning tools, such as;

e-learning technologies reduce the learning time requirements by an average of 50 percent and retention rate of the trainees greater with e-Learning including interactive than with a solely classroom based model [11].

Learning management System (LMS) which have a significant role in distance learning is also known as the Virtual Learning Environment (VLE) or Learning Platform. Hall defines an LMS as: "software that automates the administration of training events [2]. All Learning Management Systems manage the log-in of registered users, manage course catalogues, 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 details in the article Online Education: Discussion and Definition of Terms [11].

Many organizations are using learning management systems (LMS) to support and to improve learning within their institutions. According to Observatory on Borderless Higher Education, 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 [1]. However, the open source LMS may have an impact on the future 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 a disadvantage 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

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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)[6]. Figure 1 shows that open source application and web server software are used in an open source e-learning system.

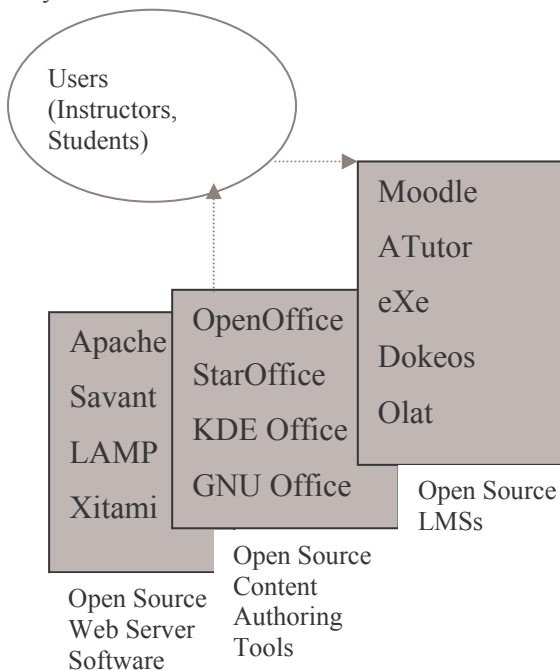


Figure 1. Open Source Application and Web Server Software

Advantages of Open Source Software

Most debated advantages and disadvantages of open source (OSC) software are; total cost, other financial and forensic subjects [8].

Advantages of using OSC software can be summarized as follows [8]:

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 [7]:

- 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 [3,4]:

- 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).

Moodle LMS, by taking advantages of the trials on usage in different projects have been used to prepare the following table.

In this study, the mostly preferred four LMSs are selected among from fifty free and open source LMSs on the web site of UNESCO [16]. The features of three LMS's (ATUTOR, DOKEOS, OLAT) have been analyzed by using the full Access demo versions accessed from their web sites and a detailed analysis carried out by creating courses on each LMS. For

TABLE I. COMPARISON OF OPEN SOURCE LEARNING MANAGEMENT SYSTEMS

OPEN SOURCE LEARNING MANAGEMENT SYSTEM	MOODLE	ATutor [6]	DOKEOS [7, 8]	OLAT [9]
Support and Compatibility to Standards (AICC, SCORM)	Scorm and IMS Content Package support.	Scorm and IMS Content Package support	Scorm and IMS Content Package support. Ability to import different LMSs course that are in Scorm Format.	Scorm, IMS Content Package and QTI support
Multiple Language Support	77 different foreign language support	64 different foreign language support	5 different foreign language support	14 different foreign language support

Online Exam	10 different type question support exams can be prepared according to time, date and duration constraints. Includes "Secure window" option for exams.	8 different type question support Exams can be prepared according to time, date and duration constraints.	6 different type question support Exams can not be prepared according to time, date and duration constraints.	4 different type question support Exams can not be prepared according to time, date and duration constraints.
XML support	Exists	Exists	Does not exist	Does not exist
CHAT and GROUP WORK	Includes chat and group creating tools. Each user can work in his/her own group.	Includes chat and group creating tools.	Includes chat and group creating tools.	Does not include chat and group creating tools. Course content can be separated according to groups
Ease of installation and maintenance	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 in their home site.	Not enough installation and maintenance documents
The follow-up of student's learning process	Visited links, contents, sources and all activities done by visitors can be seen in 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 in with date details
Including content development and content authoring/editing tools ,modularity.	There is an Html based content editor. Course pages can be edited as Html pages and new application can be added as a modules.	There is an Html based content editor. Does not have a modular structure.	There is anHtml based content editor. Does not have a modular structure.	There is anHtml based content editor. Does not have a modular structure.
User Authentication	Rather than its own database, the data can be hold in different servers such as ; LDAP,IMAP..	User passwords holds in its database.	User passwords holds in its database.	User passwords holds in its database.
Survey and forum support	Exists	Exists	Exists	Exists

Calender	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.
Video Conference Support	Exists. Also holds "White Board" application. (For Moodle version 1.6 and upper WiziQ live Class Module exists)	Does not exist	100 user can connect at the same time and "White Board" application does not exist..	Does not exist
Backup Tools	System can get backup automatically in required time and date. Every module can be backup seperately.	All course content can be backup manually. Modules can not be backup seperately.	All course content can be backup manually. Modules can not be backup seperately.	All course content can be backup manually. Modules can not be backup seperately.
System Requirements	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
User Interface and ease of usage	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	Owns a good menu design. Very sleek, easily modified by individual user (e.g., menu locations, icons vs. text, font, colors)	Owns a good menu design.	Owns a complicated menu design.
Multiple Input Support (Multimedia etc.)	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
Frequency of Usage	73.000 registered users	23,925 registered users	600 registered organizations	150 registered organizations

In Table I, it can easily be analyzed that, Moodle and ATutor stand out with their features among other open source LMSs. Moodle is the only LMS which has wider options with different access possibilities, modular structure, and advanced backup tools.

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.

As a learning communication tool, Moodle LMS owns debate forums, file transfer, e-mail, calender and white board and real time chatting options.

As different from other LMSs, in moodle there are different access possibilities from different groups for the administrators. These are administrators, educators, students and guests accounts.

Educators can save students text files that are limited only for course usage or students can save their documents by themselves.

Educators can put discussions and course activity to special dates however system can check these dates and synchronize course dates according to the corporate calendar.

Moodle and ATUTOR have an advanced online exam module with time, date and duration constraints. As shown in Figure 1, 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.

Educators have the ability to view full user logging and tracking - 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's involvement including postings etc on one page.

There are three course formats in the software such as by week, by topic or a discussion-focused social format. 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 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.

Analysis shows that language is an important issue having an impact on the selection and use of LMS systems according to Paulsen's data [10]. With the 77 language support, and the numerical data in the frequency of usage as shown in Table I proves why Moodle is the most preferred open source LMS. In addition to the features listed above, only Moodle and Dokeos have "video conferencing" support within other softwares. With this software, virtual class application can be performed by using tools such as; online chat, file transferring (.pdf, .swf, .doc, .docx, .xls, .xlsx, .ppt, .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 1 [10].

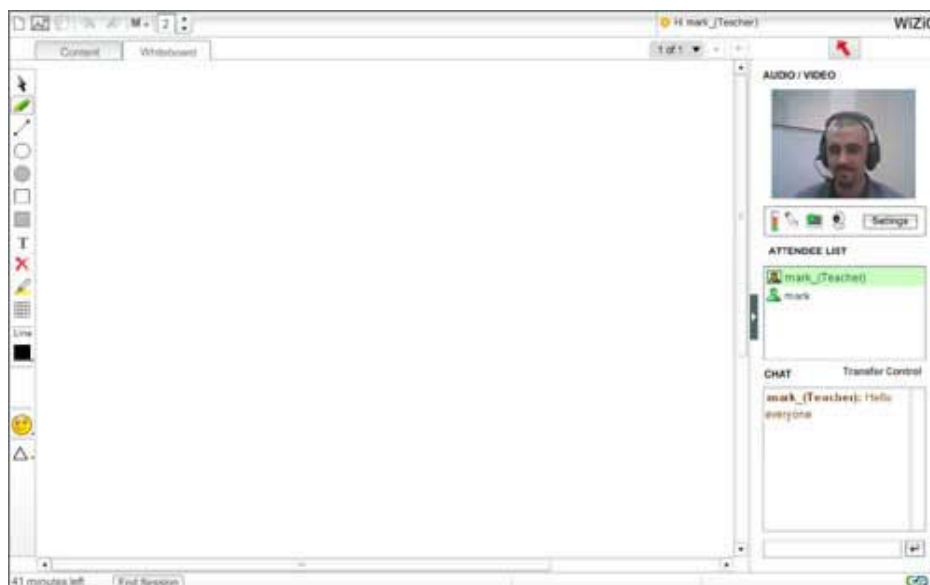


Figure 1 Video Conference and White Board Application Screen Shoot

Multimedia support in this software adds a significant value to especially language teaching. As shown in Figure 2, with advanced exam and

assessment modules, educators can create questions in many formats.

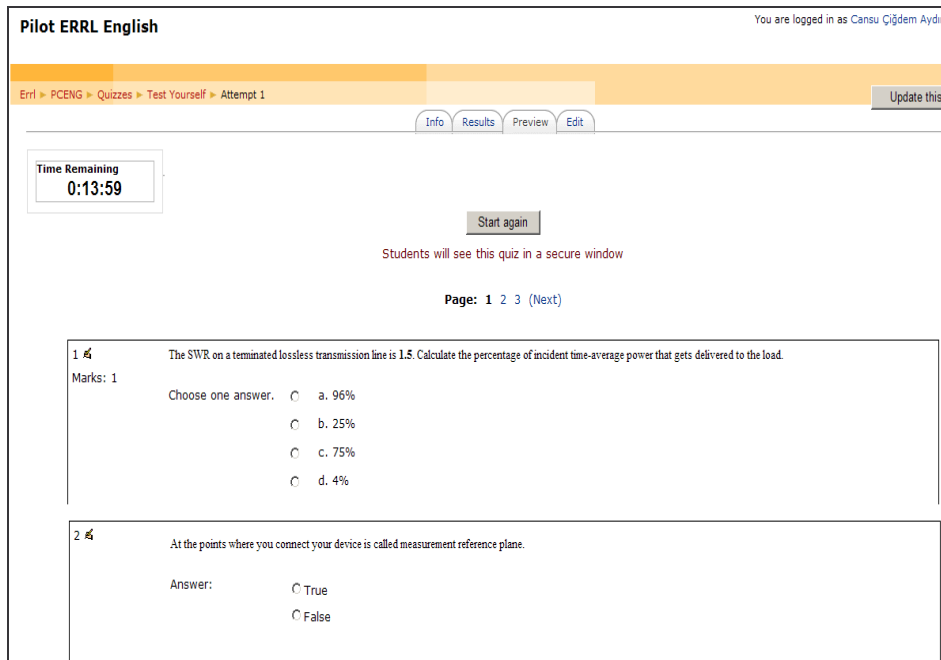


Figure 2. General Look of an Exam Module

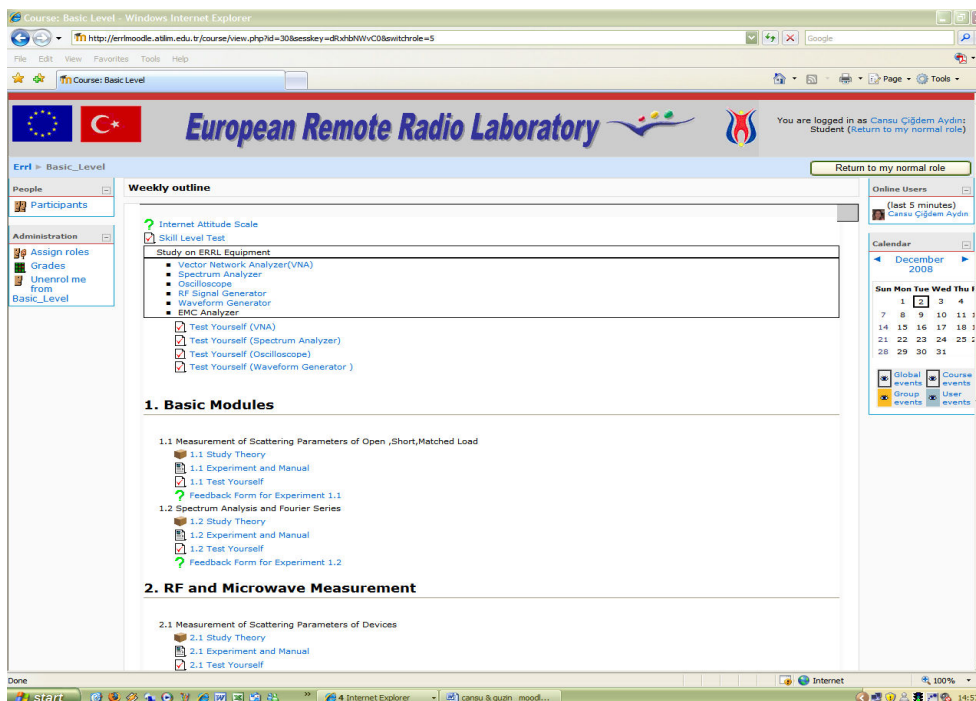


Figure 3. Weekly Course Schedule

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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