

Learning Management Systems and Comparison of Open Source Learning Management Systems and Proprietary Learning Management Systems

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Abstract: *The concept of learning has been increasingly gaining importance for individuals, businesses and communities in the age of information. On the other hand, developments in information and communication technologies take effect in the field of learning activities. With these technologies, barriers of time and space against the learning activities largely disappear and these technologies make it easier to carry out these activities more effectively.*

There remain a lot of questions regarding selection of learning management system (LMS) to be used for the management of e-learning processes by all organizations conducting educational practices including universities, companies, non-profit organizations, etc. The main questions are as follows: Shall we choose open source LMS or commercial LMS? Can the selected LMS meet existing needs and future potential needs for the organization? What are the possibilities of technical support in the management of LMS? What kind of problems may be experienced in the use of LMS and how can these problems be solved? How much effective can officials in the organization be in the management of LMS? In this study, primarily e-learning and the concept of LMS will be discussed, and in the next section, as for answers to these questions, open source LMSs and centrally developed LMSs will be examined and their advantages and disadvantages relative to each other will be discussed.

Keywords: Learning Management Systems (LMS), Open Source Learning Management Systems, E-Learning, Proprietary Learning Management Systems, Decision Support for E-Learning Projects, Architecture of Learning Management Systems

1. Introduction

Learning is a vital element not only for the persistence of human beings but also for the existence of businesses and their competition power. In the age of information in which an increasingly complex pile of collective information is created through learning and teaching, the concept of e-learning has been emerged thanks to the rapidly evolving information technologies and due to reasons such as population growth, traffic problems in cities, increasingly valuable time management, difficulty in meeting the same targeted learning demands in the same physical space, the widespread of working at home-office, the idea of democratization in education and information becoming more accessible; and these developments gave way to the emergence of learning management systems that assist in managing the process of e-learning.

As is the case in the choice of each information system, there are decisions required to give in the selection of LMS, one of the most important decisions is whether the LMS to be used should be a system that has a license fee and is centrally developed one or an open source system with volunteer developer audience and without any need for license fee. This decision is the one directly affecting the quality of training activities, their cost and success in the organization. The organization, while giving such decision, must evaluate the true capacity of using outsource, its budget, objected training activities and informational capabilities. Although IT managers around the world seem to split into two in the dilemma of open source code and commercial central development, this decision is related to capabilities, budgets and priorities of organizations rather than personal perspectives.

2. E-Learning

The concept of E-Learning emerged as a result of developments in technology, economics, social and cultural life, and other numerous factors being reflected in the education. E-learning is a concept in

which digital training contents are provided to participants via the internet, intranet or extranet connection and participants are provided with various options of communication. In plain words, e-learning is the ability to access learning tools (learning resources) anytime and anywhere (Holmes & Gardner, 2006; Yilmaz, 2012). According to Rosenberg, e-learning is the use of Internet technologies to increase information and performance (2001, p. 11). E-Learning and Distance Learning may be confused with each other. E-Learning is a form of distance learning (Rosenberg, 2001). Following the use of radio and television channels in education, in the early 90s, distance learning activities started through CD-ROM and DVD-ROMs and with the use of Flash-based multimedia contents and these activities have evolved into e-learning with the spread of the Internet. The e-Learning process is managed through Learning Management Systems (LMS).

E-Learning offers the following advantages over the classical learning (Rosenberg 2001; Zhang *et al.*, 2004):

- Being independent of time and space with constant accessibility
- Time and cost savings
- Ability to enrich the content limitlessly with the use of multimedia technologies (audio, visual, video, game etc.)
- Moving the classical learning process to electronic environment completely or supporting the process
- Instructor's ability to prepare content for once and to use the line for improving knowledge
- Students' ability to repeat subjects as much as they want
- Ability to virtualize classical learning in applications such as live board in LMSs
- Ability for unlimited number of participants to benefit from the same training

In addition to its benefits, E-learning also has a number of disadvantages (Zhang *et al.*, 2004):

- When it comes to professional purposes, the LMS is required. If a team of experts with the ability to benefit from open source technologies is absent, licensed software is preferred, and entry coast of this software is high.
- To create content, it is necessary to learn a number of visual processing, word processing software.
- If enough technical support service is not provided, there may be delays in training.
- As it is possible to conduct e-exams by means of LMSs, there exist security vulnerabilities.
- Certain trainings may not be suitable to e-learning due to their nature. As an example, trainings in the medical field are quite limited.
- When these systems were used for the purpose of university or high school education, anti-sociality may emerge among students.
- These systems may appeal to conscious and self-motivated student population who can manage time.

In the literature, E-Learning is classified by various characteristics, and classification is widely made in the form of two groups such as synchronous and asynchronous:

In the synchronous e-Learning, educational and learning process that students experience in a physical environment is virtualized. Through an LMS, learning is experienced through technologies such as electronic board applications, live chat applications, video conferencing systems etc. Learning activity is scheduled in advance and everyone must be online in the system at the same time. Active party is the instructor (Henderson, 2003, Yilmaz, 2012).

Asynchronous e-Learning is a type of learning in which students experience learning activities, fictionalized by the instructor, at will and the active party is students (Henderson, 2003, Yilmaz, 2012). Students access the contents presented to them (course material, video, forum, e-test, etc.). In asynchronous e-Learning, basic training contents are created once and updated based on needs, therefore, human resources and cost saving may be achieved.

Using e-Learning as a supporting element for classical learning methods is called as "blended learning" (Garrison, 2011). Blended Learning should be examined under the scope of asynchronous e-learning title by definition. At universities, academicians may develop additional contents through LMS to support courses and offer students a blended learning application.

3. Learning Management Systems

Only learning activity via the Internet is required to speak of e-learning, this may even occur through widely used video chat tools. Nowadays it is possible to make video conference calls with a great number of participants for free. However, a web-based system is required with the participation of students and instructors to realize activities such as systematizing keeping statistics relating to students, benefiting from multimedia contents, sharing course materials and holding an exam etc. These systems are called Learning Management Systems. According to Lohn and Teasley, LMS can be defined as follows: "*Learning Management Systems (LMS), are web-based systems allow instructors and students to share instructional materials, make class announcements, submit and return course assignments, and communicate with each other online*" (2009). LMSs were used by educational institutions, universities, corporations and governments with a view to manage e-learning processes. Companies use LMSs not only in on premise trainings but also for customer trainings. E-learning companies with commercial product of LMS offering training contents in various topics with B2B or B2C model are popular nowadays. As in all software preferences, for LMSs it is an important feature to have a central database and contain a modular structure. In the literature, there are studies available that list and explain modules in products such as Moodle or Blackboard product modules (Bremer & Bryant, 2005; Machado & Tao, 2007; Allen & Tirkes, 2010). However, in this paper related modules and properties are analyzed from an brand-independent point of view:

Course Module

This is the module in which training contents to be shown in the system are contained. Here, the course methodology is presented and established multimedia contents are presented to students. It is possible to present the course in a scenario with weekly stages, but also all content can be served at the same time, course content can be set to be revealed based on a time frame. Announcements, exams and activities to be provided to students are monitored in this module.

User Module

This is the module in which user roles are set, preliminary information to be requested from users in the phase of registration are defined, users can be separated into grades within its permitted roles granted by the system administrator.

Exam Module

This is the module in which instructors establish e-exams and answers with mathematical precision which can be controlled by the system automatically. When open ended and text-based questions are asked, evaluations are conducted by the instructor. There are actions available such as auto-establishment of documents such as certificate, transcripts etc. to students based on exam results.

Assignment Module

This is the module in which digital file announcements for homework or time for such tasks can be defined, and in which the instructor analyzes and evaluates tasks.

Reporting Module

This is a module in which students' success in exams, their participation in courses, their usage habits can be followed, and all other system related statistics can be produced. Each user can access to statistics based on his/her role.

Other Characteristics

In addition to these important modules, there are also standard and supported elements available in LMS such as modules including live chat, forum, polls, wiki and video conferences with live board.

One of the most important building blocks in the structure of LMSs is user roles, and characteristics of LMSs can be examined on the basis of these roles. Basically in LMSs, there are predefined roles available such as Student, Instructor, Course Manager, System Administrator, and powers of these roles may be reviewed, and new roles may be defined based on needs. In the LMS architecture, users with various roles may reach the content on LMS by means of a network connection (Internet, intranet or extranet) based on their authority. Data belonging to users, course data, system data etc. are kept in relational databases. LMS must be open for integration with different IT systems, and mutual information transfer and synchronization must be provided (Finke, 2004). Nowadays, LMSs used by

companies in personnel trainings can be considered for integration with HR (Human Resources) modules of ERP (Enterprise Resource Planning) systems; therefore, it is possible to increase motivation by associating personnel development with their personnel rights.

Like every system currently in use, LMSs have also established their own standardization. The content form called SCORM (Sharable Content Object Reference Model) has become a standard for e-learning (Advanced Distributed Learning Initiative, 2001). When a prepared e-learning content is converted into this format, they have become available again in each LMS supporting this format. This development facilitates the deployment of knowledge freely. Besides, from an organization-oriented point of view, this development enables organisations to change their LMS choices quickly. Further, it increased competition in LMS market.

4. Learning Management Systems: Open Source vs. Proprietary

As in each investment to be conducted by organizations, there are important issues to be considered in the decision of LMS investment. These are elements regarding business or informatics such as usefulness of the system, suitability to the needs of institution, total cost of ownership, return on investment. However, the first decision to be given is whether the software to be used will be an open-source or closed-source coded software. If software is open source, this does not always mean it is free, and being free does not always mean the software is open-source. However, by analyzing widespread options offered as open source in LMS software (Moodle, Sakai, Dokeo etc.) it can be seen that they are free, but software with closed-source codes (Blackboard, SAP, HCM, LMC etc.) are paid. Therefore, in this study, it should be taken into consideration that open source software which are free is selected for comparisons.

The organization should not only analyze the characteristics of LMSs in question but also evaluate e-learning project and organizational capabilities before making the decision of open-source vs commercial options. With the following perspective, these decisions can be supported:

System Development and Management

- How much will the organization be effective on the LMS which will be used?
- How many people are there in the team that will attend this LMS directly and indirectly and what are their statuses of experience in this topic?
- Are there people available in the organization if any needs for a development on LMS emerge?

Project Requirements and Scope

- How many people will benefit from the training regarding LMS? How much capacity will be needed in the future?
- Will popular LMS features be enough in the project? How much customization is required?
- Is there enough amount of hardware and network connection services available for the project? If not, what are the costs of required systems?

Budget

- Is the budget enough for paying the license fee for commercial software, to realize and maintain the project?
- In case of using commercial software in the project, how much relevant will consulting and training activities cost? How many people in the organization will be billed in the project to realize this project when an open source software was used?

Technical support

- Since there will not be a technical support service in an open source LMS, can IT unit of the organization merge their knowledge and expertise with documentations and forums to solve problems? If a commercial LMS is selected, how long and on what basis will the supplier company provide technical support in the agreement?

Sustainability

- Does the LMS to be selected update regularly and does it follow the trends?
- In what time intervals are new hardware and web technologies included in LMS?
- How long does it take to eliminate any found and informed security vulnerability?

Conformity with the Existing and Future Systems

- How much effort is required to adapt the LMS to existing systems?
- Does LMS offer API (Application Programming Interface) services?

Answers to these questions can be used as supporting factors in the decision of LMS selection. With a team capable and adaptable to new technologies, it is possible to implement powerful but low-cost e-learning projects by using an open source LMS. On the other hand, using an open source LMS with a team lacking enough capability and motivation will lead to failure, total amount of wasted time and resources may be higher than that of selecting a commercial LMS with expert advisors for the project.

There are certain differences between open source LMSs and commercial LMSs:

Tab 1: Comparison of Open Source LMSs and Commercial LMSs as per Various Criteria

	Open Source LMS	Commercial LMS
Fee	Nearly all products in the market are completely free of charge.	There are prices for license and license renewal.
Technical support	Technical support takes place in the form of asking questions/receiving answers in user forms and published documents. In cases of inadequacy, professional consultant is required.	The company offers technical support within the service agreement.
Hardware and Scalability	LMS is hosted on organization's own server. There is a need for specialized personnel for server maintenance. Alternatively, the server can be leased and outsourced.	Within the scope of agreement, LMS can be hosted in its own server or on supplier company's servers.
	By analyzing successful projects, it can be determined that LMS can be scaled in a way to serve for 50 users or 5,000 users in the same quality.	Scalability within certain limits is guaranteed by the supplier company.
Development	With the programming language of the LMS, it is possible to make unlimited development as per needs. In addition, ready-made solutions can be obtained by purchasing plugins adequate for the needs of LMS.	Developments are in supplier company's initiative. The company, with a view to keep customer satisfaction high, improves the product but these developments may not meet the specific needs of the organization. In this case, as per the agreement, additional payments may be required to overcome such issues.
Security	The Organization must take measures to protect all data in the LMS.	System security is usually guaranteed by the supplier company.

	Since open-source systems are developed and tested by thousands of people, their security vulnerabilities can be detected quickly and updates for the system are published.	In possible security vulnerability, system may remain vulnerable, and data loss and data leakage may occur. Reliability and competence of the company must be analyzed.
Integration	Since source codes are open source for adaptation to existing and external systems, all projects may be implemented as much as the LMS architecture allows.	Since source codes are closed, there is a dependency to the supplier company regarding the integration. What does the supplier company offer in terms of integration and promise to provide with additional payments? Are there special applications offered for organizations? Integrations can be provided with these two questions.

5. Conclusion and Discussion

E-Learning is a major technological and pedagogical development that improves the quality of human life, and one of the most important elements determining its quality is LMS features. E-Learning, at the same time, is also a very significant tool for cost saving and democratization in education. Nowadays, geographically dispersed organizations, for instance, banks with hundreds of branches, begin to move their personnel trainings completely in electronic environment and achieve significant cost advantages and increase personnel motivation. In addition, individual learning activities take an important place in individuals' social lives, people have increasingly received education from non-profit e-learning organizations or e-learning companies to obtain competencies such as new software, foreign language learning, professional development, artistic talent etc.

In this study, criteria that need to be taken into consideration in LMS selection are emphasized and the importance of this choice to manage existing e-learning processes in a most effective and efficient way is stressed. In general, it can be said that open source LMSs are appropriate for companies operating in the field of technology, for start-ups and SMEs with budget constraints but with motivation and competencies open to development. On the other hand, it can be concluded that commercial LMSs are suitable for organizations that does not have software technologies as their main line of work, that do not have an objective of contributing to open source systems and for businesses without any budget problems.

Nowadays, in digital discussion platforms, it can be seen that some IT professionals and system managers are fanatical about open source systems or commercial systems. On the other side, considering commercial or open-source LMSs that can even support smart watches, it can be determined that the development of these systems is in parallel with new trends. Therefore, from an objective point of view, it can be concluded that it is necessary to act by considering the scope of the project and facts of the organization.

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