

A Comparison and Evaluation of Administration and Security Tool of Open Source Learning Management Systems

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Abstract

Online Learning is becoming an important tool to allow the flexibility and quality requested by learning process. In the recent past, a great number of open source learning management system (OSLMS) has been introduced in the market showing different characteristics and services. All these OSLMS reduces cost acquired by proprietary LMS. Market is occupied with large number of OSLMS. So before selecting any OSLMS it is necessary to consider series of features, function and usability of the overall learning system.

The main purpose of this study is to analyze and explore the right decision when choosing a suitable OSLMS platform to meet the requirements of education system.

A different criterion needs to be considered while evaluating OSLMS. These criteria includes communication tool, productivity tool, student involvement tool, administration tool, course delivery tool, curriculum design, course delivery tool, software and hardware requirement, pricing and licensing issues.

This study focuses on evaluation of curriculum design tool of seven OSLMS which includes Moodle, Atutor, Sakai, Ilias, Claroline, Olat and Dokeos.

Keywords

Learning management systems (LMS), Open-source learning management systems (OSLMS),

1. Introduction

In the last decade the usage of Internet has been increased exponentially and new technologies have improved students education. Based on the new technologies, learning environments are able to provide a wide range of educational alternatives. Distance learning is one of these alternatives where student and instructor are remotely located and are flexible with respect to time and place constraint [1].

LMS have significant role in distance learning, which is also known as virtual learning environment (VLE). Halls defines LMS as, "Software that automates administration of training events" [2].

In distance learning process OSLMS are widely used. OSS represents a social dimension of learning through a Persistent, Unified, Multi-User, and Self-Organizing environment extending beyond the traditional classroom where learners build knowledge and understanding through collaborative exchanges both within and across subject area boundaries.

For the selection of best OSLMS, it is necessary to establish proper evaluation criteria.

This paper evaluates seven OSLMS. Each OSLMS program is based on the ability to accommodate different active learning experiences in online courses. The selected OSLMS are Moodle, Atutor, Olat, Sakai, Ilias, Caroline, and Dokeos.

The comparison has different perspective which includes administrative, faculty and student perspectives. A LMS must address the needs of the ultimate end user: the learner. Each LMS has key features that allow students to be actively involved in their courses.

This paper is organized as follows. Section 1 represents brief introduction of paper. In Section 2, literature review has been carried out. Section 3 shows base for the selection of LMS, need of comparison for selected LMS and general information about selected LMS. A comparative study of selected OSLMS is presented in Sections 4. Section 5 displays results of the study. Section 6 represents conclusion of the study.

2. Literature Review

Jamil Ahmad Itmazi and Miguel Gea (2005) [3] have carried out paper surveys of 58 studies of comparison and evaluation of OSLMS and proprietary system by comparing functionality. They have recommended the most widely used OSLMS. Result of the study shows that WebCT is the mostly used proprietary LMS and Moodle is the mostly used OSLMS.

Matjaz Kljun, Jernej Vivic, and Branko Kavsek (2007) [4] have reviewed 31 LMS comparison and evaluation (written between 1998 and 2006) papers. Comparison methods includes Feature comparison, Learning paths support, SCORM specs, OSS

compliance, Student centered, Learning tools based, Technical specs, Conversational Framework, Questionnaire based, Features usability, and Use-case and feedback. The study reveals that present LMS development tries to catch up with standards, although the SCORM standard is unfortunately not as widely supported.

Peter Lengyel Miklos Herdon and Robert Szilagyi (2006)[5] have done the comparison amongst Atutor, Moodle and OLAT by considering various parameters like support and compatibility to standards, content development and content authoring / editing tools, modularity, backup tools, user authentication, video conferencing, group facility, chat facility, XML support, system requirements. The study shows that Moodle is at higher position supporting 13 features out of 14. Atutor and OLAT support 9 features.

Guzin Tirkes (2010) has [6] done the comparison amongst Atutor, Moodle and OLAT and Dokeos by considering support and compatibility, content development and editing tool, modularity, backup, user authentication, video conferencing, online examination question, group, chat, email etc. Result of their study is shows that Moodle possesses all 17 features, Atutor and OLAT supports 12 features, whereas Dokeos support 15 features.

Barbar A. Lewis and Virginia M. MacEntee (2005) [7] have evaluated WebCT, v.4.1; BlackBoard, v. 6.1; Jones E-education; Educator; Angel; .LRN; McGraw Hill Pageout; Moodle; and e-College AU. They considered various comparison features like content development, discussion area, group participation, calendar, chat, student study

tool, audio, video, student progress and email. Study shows that amongst the proprietary LMS WebCT is at topmost position. Amongst OLSMS, DotLRN is at topmost position and Moodle is at second position.

The report of commonwealth (2003) of learning [8] has evaluated OSLMS Moodle, Lon-Capa, Ilias, DotLRN, and Atutor. Comparison parameter includes features, maintainability, usability, reliability, scalability etc. each feature is evaluated on the basis of 0-5 scale. Study shows that Atutor is having highest scale of 42. Ilias is having 41 scales. Moodle is having 37 scales and LON-Capa is having 37 scales.

Sabine Graf & Beate List (2005) [9] have evaluated 9 OSLMS. The main focus is on adaptation issue. Qualitative Weight and Sum Approach is used for this purpose. Comparison includes Atutor, Dokeos, DotLRN, ILIAS, Lon-Capa, Moodle, OpnUSS, Sakai, Spaghetti learning. The adaptation issues include communication tools, learning objects, user data management, usability, adaptation ha, technical aspects, administration, and course management. Rank was given to each platform. Moodle s achieved the best evaluation values. Ilias has second rank and Dokeos has third rank. ATutor, LON-CAPA, Spaghettilearning, and Open-USS are ranked equally at the fourth position, whereas Sakai and dotLRN are ranked last.

Jing Liu, Men and Jun Han (2009) [10] have compared and evaluated 5 OSLMS namely Atutor, Moodle, Sakai, Calroline and Dokeos. They have not ranked the LMS. The study shows that Moodle is better for process assessment. Sakai can be used for better

summary assessment. For community purpose Sakai is perfect. If the teacher is novice user in teaching Claroline can be used. For functioning of videos Dokeos is best.

3. Selection of OSLMS

From the above literature review it is clearly observed that most of the studies include comparison and evaluation of Moodle, Atutor, Olat, Dokeos, Sakai, Claroline, Ilias, LON-CAPA, OpenUSS, ADA, Spaghettilearning, DotLRN and Olat. Selection of OSLMS is based on rating given by this study. Again evaluated research papers are backdated. Current comparison and evaluation in today's scenario is not available. So it is necessary to carry out latest evaluation of all these OSLMS to know its current capabilities.

With the help of result of past studies, the selected OSLMS are Moodle, Atutor, Olat, Sakai, Ilias, Claroline, and Dokeos.

4. Comparative study of OSLMS features

OSLMS features are divided into category as learner tool, support tool and technical specification. Each of these categories has different types of subcategories.

Support tool includes curriculum design tool, administration tool and course design tool.

Each of them has different features. Following figure shows architectural design view of administration and security tool.

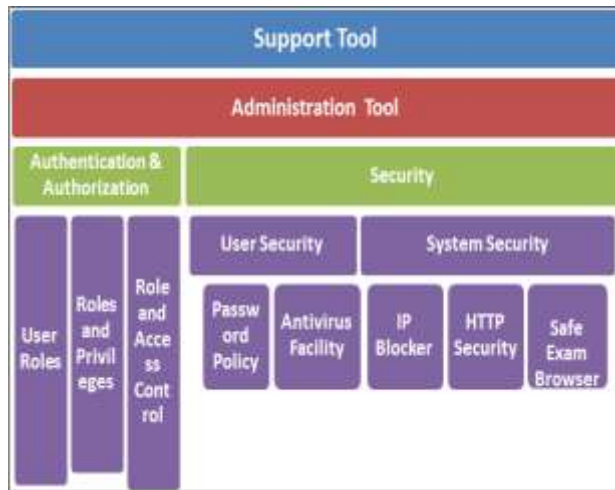


Figure 1: Architectural design view of administration and security tool

Above figure shows that administration and security tool have features like authentication & authorization, security. Authentication and authorization has features like user roles, roles and privileges and access control. User security has feature like password policy. System security has features like antivirus facility, IP blocker, HTTP security, and safe exam browser. Each of these features and its evaluation result with respect to Moodle, Atutor, Olat, Dokeos, Sakai Ilias and claroline are discussed below.[11,12,13,14,15,16,17]

4.1 Authentication and Authorization

Authentication is the process of verifying the identity of a user with the help of credentials. These credentials may be user id or password. If the credentials are valid, then it means that authentication process is completed. After that authorization process starts. [18,19]

Authorization is required whenever user wanted to perform some tasks or wanted

to access some resources. Authorization is the process of enforcing policies for determining type of activities allowed, type of resources that can be accessed. Usually, authorization succeeds authentication. For each type of user role it is necessary to carry out authentication and authorization process. [18, 19]

There are different types of user's roles available in each learning management system. These roles and privileges are defined in the table below. [Refer Appendix A – Table 1]

4.2 Access Control

Access control mechanism determines how, information and resources will be accessed by user. It also determines interaction between users and systems. [20]

The table below display role creation and access control mechanism related to Moodle, Atutor, Olat, Dokeos, Ilias, Sakai, and Claroline. [Refer Appendix A – Table 2]

4.3 Users Security

Identification and authentication of a user is important aspect for protection of data. There are 2 types of security, user security and system security. [21]

The table below shows user security features of Moodle, Atutor, Olat, Sakai, Ilias, Dokeos and Claroline. [Refer Appendix A – Table 3]

From the table, it can be observed that Moodle is having all features. Whereas Olat, Dokeos, Ilias, Sakai and Claroline are not supporting any user related security features.

4.4 Password Policy

Password policy may include minimum password length, number of digits, number of special symbol, number of uppercase and lowercase letters. Password should be designed in such a way that it should be difficult to hack.

The table below displays password policy mechanism for Moodle, Atutor, Olat, Dokeos, Ilias, Sakai, and Claroline. [Refer Appendix A – Table 4]

From the table it can be observed that Moodle and Dokeos are satisfying all rules of password policy. They are at top position supporting all 8 features. Atutor and Olat are at second position supporting 6 features. Sakai is at third position supporting only 2 features.

4.5 Antivirus facility supported by OSLMS

Antivirus software is used to prevent, detect, and remove software viruses. The table below shows list of available antivirus related to OSLMS Moodle, Atutor, Olat, Dokeos, Ilias, Sakai, and Claroline [Refer Appendix A – Table 5]

4.6 System security

It includes features such as login with the help of secured HTTP, IP blocker, and integration of Safe Exam Browser integration. [21]

4.6.1 IP Blocker

IP blocker is used to specify list of allowed IP addresses and IP addresses to be denied. [22]

4.6.2 HTTPS security

HTTPS stands for Hyper Text Transfer Protocol Secure.

HTTPS encrypts the username and password before transferring it from user's browser to the server. [23]

4.6.3 Safe Exam Browser

Safe Exam Browser is used to conduct online exams securely. It prevents access to other websites or any applications. [24]

[Refer Appendix A – Table 6]

5 Result

Result of the above comparison and evaluation is summarized in the table below. The table shows top 3 OSLMS related to administration and security tool features. [Refer Appendix A – Table 7]

6 Conclusion

The summarized table shows that total 18 features are compared related to administration and security tool. From the above table we can conclude that Moodle is at 1st rank supporting all 18 features. Dokeos is at 2nd rank supporting 10 features. Atutor and Olat have 3rd rank supporting 9 features. [[Refer Appendix A – Table 8]

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Appendix- A

Table 1 : List of roles and privileges assigned		
Sr.No	Keyword	Privileges assigned
1	Administrator / platform administrator / System Administrator	Can "do everything" on the site including assigns rights, manages users, and deletes obsolete learning content.
2	Super Administrator	No restrictions and has access to all of the administrator options. This is the only administrator type that can create and delete other administrator accounts.
3	Group Administrator	Manages group administrator activities.
4	Inactive Administrator	An administrator account that has not been assigned any access privileges.
5	Active / Assistant Administrator	Limited access. Only to sections that they were assigned.
6	Teacher / Instructor /Author/ Tutor/Course Builder/Trainer	Can manage and add content to courses.
7	Course creator / Tutor / Teaching Assistant / Co-Author	Assisting to teacher. Can create course & course content, but can't participate in other activities.
8	Non editing teacher	Can grade in courses but not edit them
9	Student / Learner	Can access and participate in courses.
10	Manager / HR Manager	A lesser administrator role.
11	A nonymous user / Guest	Not registered and limited access.
12	Authenticated user	Logged in users.
13	Blocked user	Users are not allowed to log in.
14	Deleted user	Users who are deleted

Table 2 : Role creation and access control								
Sr.No	OSLMS Name	Moodle	Atutor	Olat	Dokeo	Ilias	Sakai	Claroline
1	Define roles on creation of user	Y	Y	Y	Y	Y	Y	Y
2	Manage role(Add, view, update, delete role)	Y	Y	N	N	N	Y	Y
3	Assign features of one role to another role	Y	N	N	N	N	Y	N
4	Temporarily switching of role	Y	Y	Y	Y	Y	Y	Y
Total No. of Features available		4	3	2	2	2	4	3

Table 3: User Security Features								
Sr.No	OSLMS Name	Moodle	Atutor	Olat	Dokeo	Ilias	Sakai	Claroline
1	Protect username	Y	N	N	N	N	N	N
2	Allowed and denied email domains for self-registration	Y	N	N	N	N	N	N
Total No. of Features		2	0	0	0	0	0	0

Sr.No	OSLMS Name	Moodle	Atutor	Olat	Dokeo	Ilias	Sakai	Claroline
1	Minimum & maximum password length	Y	Y	Y	Y	N	N	N
2	Presence of digits in password	Y	Y	Y	Y	N	N	N
3	Presence of lower case characters in password	Y	Y	Y	Y	N	N	N
4	Presence of Upper case characters in password	Y	Y	Y	Y	N	N	N
5	Presence of special symbol in password	Y	Y	Y	Y	N	N	N
6	Lock user after certain attempts if wrong password is entered	Y	N	N	Y	N	N	N
7	Force password change	Y	N	N	Y	N	Y	N
8	Captcha (Completely Automated Public Turing test to tell Computers and Humans Apart)	Y	Y	Y	Y	Y	Y	N
Total No. of features available		8	6	6	8	1	2	0

Sr.No	OSLMS Name	Antivirus Name
1	Moodle	ClamAV
2	Atutor	N
3	Olat	N
4	Dokeos	N
5	Ilias	N
6	Sakai	ClamAV
7	Claroline	N

Table 6: System security features

Sr.No	OSLMS Name	Moodle	Atutor	Olat	Dokeo	Ilias	Sakai	Claroline
1	IP Blocker(Deny access to list of IP's)	Y	N	N	N	N	N	N
2	Use of HTTPS	Y	NF	NF	NF	NF	NF	NF
3	Safe Exam Browser integration	Y	N	Y	N	Y	N	N
Total No. of Features		3	0	1	0	1	0	0

Table 7: Ranking table of OSLMS

Sr. No	Features compared and evaluated	Total compared features	First ranked OSLMS	Second ranked OSLMS	Third ranked OSLMS
1	Role creation and access control	4	Moodle, Sakai (4)	Atutor, Claroline, (3)	Olat, Dokeos, Ilias(2)
2	Password policy	8	Moodle, Dokeos(8)	Atutor, Olat(6)	Sakai(2)
3	Antivirus	1	Moodle, Sakai(1)	Others have not supported built in antivirus facility	
4	System security	3	Moodle(3)	Olat, Ilias(1)	Others have not supported these features
5	User security	2	Moodle(2)	Others have not supported these features	

Table 8: Summary of the features supported by OSLMS

OSLMS Rank	First ranked OSLMS	Second ranked OSLMS	Third ranked OSLMS	Fourth ranked OSLMS	Fifth ranked OSLMS	Sixth ranked OSLMS
OSLMS name	Moodle	Dokeos	Atutor Olat	Sakai	Ilias	Claroline
Total No. of Features supported by OSLMS Out of(18)	18	10	9	7	4	3

(Note: Figures in bracket indicates total number of features available for that OSLMS)