Evaluating Comparisons and Evaluations of Learning Management Systems

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Abstract. *In the last years, numerous papers were published comparing different learning management systems (LMS). Some of them dealt with only few comparison criteria, while others included almost every imaginable feature. When faced to do a comparison ourselves, we came across many of such papers and did a research of what authors considered relevant in an LMS. By comparing papers written in different years, we tried to find out if there is a pattern of features linked to a certain time period, how a demand for new features was evolving through time, and how did LMS developers respond to this demand. We also tried to figure out the present demands and which new features will be included in future versions of LMSs.*

Keywords: LMS, comparison, evaluation methods, evaluating criteria.

1. Introduction and motivation

As a part of the e-VIZUS project (see Acknowledgements for details), which aims to assist Slovenian Armed Forces with learning materials and various online courses, we had to select such an LMS that would cover our needs and also comply with sponsors requirements. While deciding on important features of an LMS, our team came across several (similar) papers that either evaluated and/or compared different LMSs or just pointed out what was important to consider when selecting an LMS. Since all these papers were written in different time periods, we tried to find a pattern of changing criteria through time. Therefore we started a research of what authors considered important in their comparative studies of different LMSs in certain time periods, what methods they used and what the results of their research were.

The aim of this research is not a final answer to what is the best LMS on the market, but rather coverage of what many people involved in the field of e-learning thought is important to consider when selecting an LMS. Unfortunately, there is no "one size fits all" solution and there never will be. While some LMS providers emphasize numerous features, we must understand that just features do not make a better LMS. And because the selection of an LMS usually makes a big impact on the learning process, it is really important to select the right one in such a way that fulfils all our needs. Once an LMS is put in use it usually stays in use for a long time.

We also have to consider different groups of people that will use the LMS. First there are students or learners. Without them there would be no learning process. Than we have lecturers, tutors and maintainers of the system. We might also have people working in administration using a system. Each of these groups has different needs and each group might be further divided into subgroups with their specific needs. There might be other still unidentified groups as well. To find out, what kind of LMS we need, we must understand what users of such systems need and use appropriate methods to evaluate possible LMS candidates.

The paper is organized as follows. In Section 2 the methods used in empirical evaluations and comparisons are presented. Section 3 describes the method(s) we use to do our comparative study. Results are illustrated and discussed in Section 4. Section 5 gives conclusions and directions for further work.

2. Methods used in evaluations and comparisons

In many research papers, only few aspects of a system are considered. It can be important to look at a certain criterion from a certain point of view. But such evaluation cannot be decisive in selecting a suitable LMS. Rather it is just a pointer if the LMS complies with a certain criterion based on a certain method. It is really important to examine the whole picture when we select, set up and make an LMS ready for the learning process. It might be painful to find out, after the maintenance group had finished setting up the system that our users could not log in because the system was not compatible with our authentication system. Even if such LMS has all pedagogical tools we need, it cannot be used in production because no one can use it. Selecting an LMS therefore means selecting the right framework, method (or several methods) and multiple criteria of evaluation that seam important. Here some of the frameworks and methods are presented to see what seamed important to authors that carried out evaluation of LMSs. Most of these frameworks are based on past frameworks to evaluate computer software and were adopted to meet LMS needs [2,7,8,3].

In 2003, a simple framework was proposed by Dixson and Baretto [6] to differentiate between different ways in which virtual learning environments (VLE) can be evaluated. This framework includes the purpose of evaluation, type of evaluating methods and applied measures. It considers different evaluation types (summative, formative, integrative), types of experiments used in evaluation process (case study or test study) and criteria to measure effectiveness and usability of VLE. Evaluation methods include interpreting results, determine processes, identify outcomes, and detecting type of data (qualitative, quantitative, subjective, objective) or participants (general users, experts). Some of the proposed measures in this framework are usability heuristics, frequency of interactions, and learning outcomes.

In 2004, a "Framework for pedagogical evaluation of VLE" was suggested by Britain and Liber [2]. Their framework is based on two models that can be used in evaluating VLEs. The first model comes from Conversation Framework [10] which considers several ways of teaching (adaptive, discursive, interactive, and reflective). A learning process may be carried out in a VLE. The second model, Viable System Model, considers collaborative learning, which includes resource negotiation, coordination, monitoring, individualization, self organization, and adaptation. Several criteria are proposed for both models. Through different subjective methods, like filling in questionnaires or elaborating comparison grids, we can determine if a VLE meets the proposed criteria.

Some authors state that described frameworks and other similar frameworks are not good to measure LMS quality through benchmarks [3]. Benchmarks provide a formal measurement reference in comparison and evaluation of different learning environments. Benchmarks can be measured in Learning Platform evaluation model, proposed by Ferl [8] in 2005. The model emphasizes three main areas of functionality of any Learning Platform: content, communications, and management. Another model to evaluate LMSs was used by van den Berg [13] in 2005. In her thesis, she used open source software (OSS) evaluation model which uses criteria, found in other OSS evaluation and literature [5,6]. The criteria are: community, release activity, longevity, license, support, support options, documentation, security, functionality, integration, goal and origin. Some of these criteria can be used for evaluating commercial products as well, since they are general and not related only to OSS.

Table 1. Different comparison methods used in revised papers

Method	Number of papers
Feature comparison	17
Learning paths support	1
SCORM specs	1
OSS compliance	1
Student centred	1
Learning tools based	1
Technical specs	1
Features usability	2
Funct., techn., comm.. req.	2
Conversational Framework	1
Use-case and feedback	1
Questionnaire based	2

All described frameworks, models and methods were used in evaluating LMSs. Each covers certain areas and author's point of view. But many of revised papers offered only a simple subjective method in which criteria were selected

according to author's judgment (adaptability, features usability, student centred approach, etc.). More examples are presented in Table 1. The table enumerates methods used to compare different LMS platforms. These methods include features and criteria that were used in comparisons. Some criteria cover only technical aspects or SCORM compatibility. Others try to look at the whole LMS plan and consider relevant many criteria.

There are many other (maybe even better) frameworks and methods used to evaluate LMSs, but we will not cover them all. Frameworks were presented only to show what different authors tried to attain when evaluating LMSs.

3. Comparison method

As stated before, the aim of this comparison was not to find the best LMS. We compared 31 LMS comparisons and evaluations (written between 1998 and 2006) and tried to conclude if there are some indicators between compared criteria that would explain the current development state of several major (or widely used) systems.

The LMS comparison papers were chosen according to their availability on the web and their popularity (citations and web search). This is just a preliminary study that we intend to extend to include as many as possible relevant papers.

We summarized the criteria in Table 2, where we divided them in seven groups: content, communication, environment, collaboration, educational tools, management tools, and technical characteristics. Each group had several criteria and many criteria were joined together (e.g. forum, chat, instant messaging, and email support were joined into communication utensils).

Table 2. Features evaluated in papers (thick vertical lines separate criteria groups)

article - year published	On line publishing	Foreign sources upload	templates availability	Course info	Usage restriction	Calendar	Navigation, structure	Content reusability	Scorm (IMS) import	Scorm export	Scorm accivities	Communication tools	File sharing	SCORM collaboratioon	Personalization	Adaptability	Multilingual support	Portfolios	Group work, communities	Whiteboard	Assesment	Self-assesment	Evaluation	Activities support	Guided learning	Course, learning path	Scoring system, grading	Study tools	Test, query, survey	Simulations	Offline work, synch	Hierarchic score	Privileges system	Monitoring usage, tracking	Student management	Course management	Authorization (levels)	Scalability	Modularity, extensibility	Optimization of features	Configurable interface	Security, stability	Portability	Cost (of ownership)	Support (st., tutor, admin)	Integration	HW, SW
98	x	x		x	x	x		x				x							x							x		x												x						
98	x					x		x	x			x							x	x	x			x			x								x							x		x	x	x
99		x	x	x		x	x		x			x	x						x	x	x	x		x	x		x	x	x				x							x			x	x	x
00	x	x			x	x	x	x				x						x	x	x			x			x				x					x						x			x	x	x
01	x	x	x			x		x	x			x	x		x		x	x	x	x	x			x	x		x	x	x			x	x	x	x	x	x	x	x	x		x	x	x	x
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03	x	x			x							x	x						x	x								x						x	x	x										
03		x					x					x									x						x				x				x						x		x	x	x	
03		x					x		x	x		x					x			x	x		x				x							x	x						x					
04	x	x		x		x		x	x		x	x	x	x	x	x	x	x	x	x	x		x		x	x	x	x								x	x	x		x	x					
04		x						x	x	x		x					x		x	x	x		x	x		x	x	x									x	x					x	x	x	x
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If a paper covered criteria like asynchronous and synchronous communication tools, we checked communication utensils criterion, as seen in Table 2. Also if a paper compared these tools in details (like forum rights, SMS or email notifications, etc.) we again only checked communication utensils. We did not include features like "Can the new system import content from our system". In our opinion, this kind of features is not relevant to figure out how the general development of LMSs has been advancing.

The Table 2 header contains criteria while the first column contains papers sorted by year of publication. If a criterion was included in a paper the appropriate field is marked. We must take into consideration that actual comparison or evaluation and publication date can be over a year apart. But this does not affect the overall picture of LMSs development.

The whole table with references can be found at the following URL:
http://www.pef.upr.si/lms_com

4. Results

Our study shows that present LMS development tries to catch up with standards, although it is not moving really fast in this direction. The SCORM [1] standard, for example, is unfortunately not as widely supported as we might think. Support for the last version of the standard is not implemented in commonly used products, even though this standard is now already few years old. While in the past most of the comparisons only checked if SCORM or other similar packets (AICC, IMS) can be imported into an LMS, today they also check if it is possible to create SCORM packets in the LMS, if there is an export to SCORM possibility, and if SCORM activities, forums and other tools can be integrated within the LMS. This outcome was expected as SCORM standard is growing and new features are added. It is only natural that evaluators consider new features and that LMSs try to support them. But again, the progress of these features is not fast enough.

In 2003, a support for learning paths was first noticed as a criterion [4]. The other comparison discussed this criterion in 2006 [12]. Authors found out that learning paths were not supported yet or supported with very few possibilities. In four years, the LMS market did not support this feature, but it must also be said that SCORM supports learning paths in older versions. Even if importing SCORM packets (version 1.2) is supported in many LMSs this feature can unfortunately not be integrated with other activities specific to LMS.

In present papers, new trendy features are evaluated as well. Blogs, social networking, and communities are just a few. It seems that new social phenomena are quickly adopted in education and arranged to educational needs. Like forums and chat tools are obvious to be a part of LMS today it is possible that today's new features will be obvious in the future.

It is interesting that only one paper [11] emphasizes learners study tools like taking notes of a course material in built-in notepad-like applications, bookmarking forum posts, chats and other content, grouping content from different courses, creating own study guides, web pages, and similar learning supportive aids. These features were evaluated in 2005 and they might be included in all future versions of LMSs. This is the extension to user's personal environment which today includes personal chat rooms, blogs, portfolios, and document repositories.

While older papers look at course and student listings, and student and course administration as key features, these criteria are not widely found in present papers. The same applies to some other student activities like multiple choice questions and file sharing. These features are all included in present versions of major LMSs and it is hard to imagine an LMS without them. This is maybe the reason why these features are not found in present evaluations as often as they were in the past. On the other hand, SCORM standard was not considered a criterion in the past as much as it is today.

Another feature that was not considered in the past is adaptation [9]. Adaptation of learning environment based on user needs, desires, and actions is barely developed in present tools but it is included in already mentioned Conversation Framework [13] to evaluate LMSs. A multiple choice and multiple paths surveys can be a beginning of adaptation based on users actions. An example of adaptation based on user desires can also be changing course content form (colour, stress, accentuation) based on users notations or marks of the content portions. A user could, for example, mark every portion of the content as understood, semi understood or not understood material and a system would, based on this marks, emphasize certain portions

of content. This can be a helpful feature in future LMSs.

Some criteria were used in evaluations only when evaluating certain products. It seems like authors took features of one product and compared them with another product. One of such features is off-line work support and synchronization of this work back to LMS. This feature might also not be important any more since more and more hi-bandwidth (wired and wireless) internet connections are in use.

In older evaluations, authors used criteria and features that were not found in newer evaluations like integration of compact disk (CD) material and on-line material, batch student and courses input, application sharing and search possibility. Some of these features were replaced with other features. LMS integration with other systems like student information system, registration information system, and other applications that hold information about student and courses replaced the need for manually inserting students and courses into an LMS. CD material can be imported in LMS and there are more and more software-like applications (flash, shockwave, java) used on-line. Searching tools are present in all major LMSs today. If a search feature is missing it can easily be replaced with search tolls found on the web (if the LMSs content is not somehow protected). Application sharing seems not to be important any more.

Some features were included in all evaluations like communication tools (forums, chats, e-mail, instant messaging (IM), etc.). Whiteboard is also appearing throughout the papers and is still not supported in many LMSs.

5. Conclusion

To our knowledge, more than forty comparison and evaluation papers were written in the last decade. Some were published in conference proceedings, whereas others were just internal evaluations of different organizations. We compared a third of them and tried to find out evaluated features in the past that were later developed in major LMSs. It seems like most features that were considered significant in the past are today included as default features. Some of evaluated features were not developed yet and it seems they never will be. If this trend is going to continue, new features will be added to aid teaching and learning. But the development is not as fast as the marked expects.

One of the main features in the near future will have to be a complete support for latest SCORM standard with importing, exporting, and editing the SCORM content. SCORM is now widely accepted (although other standards exist as well) and new learning packets are daily created and made publicly available on Internet. Portability and reuse of learning packets is now in a front line. More support to collaboration, group work, social networking, and additional support to supervising and directing teaching and learning activities will be added as well.

Our main concern is usability of interfaces which usually decreases with growing number of features (like it happened in almost all major software products). Decisions between numerous features and usability of the interface sometimes do not get along. Developers and designers will have to take users into consideration as well. And we can only hope that users will be included in development of future designs of LMS interfaces and features.

In further work we plan to include more papers in our comparison. This will include papers that evaluate LMSs, compare LMSs or simply give advice on what should be considered when deciding on an LMS. More papers might give us some other clues on how LMSs were responding to technology progress, educational demands and (re)new(ed) ways of teaching and learning.

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