

Evaluating LMS Usability for Enhanced eLearning Experience

Alessandro Inversini, eLab, University of Lugano (alessandro.inversini@lu.unisi.ch)

Luca Botturi, NewMinE Lab, University of Lugano (luca.botturi@lu.unisi.ch)

Luca Triacca, Tec-Lab, University of Lugano (luca.triacca@lu.unisi.ch)

Abstract. This paper reports the method and results of a comparative usability study conducted on four Learning Management Systems (LMS), two commercial and two Open Source. The results suggest that there is no single most usable LMS, and that there is no significant difference in the usability of commercial vs. Open Source applications for eLearning. Finally, the paper proposes some simple workarounds that teachers and instructional developers can exploit in order to fix some LMS usability problems in student interface.

Introduction

Learning Management Systems (LMS) are complex web based applications that support online or blended learning activities by providing tools for content delivery, learning assessment, communication services (e.g., discussions forums or chat lines), and course management (e.g., editing, back-up, enrollment, etc.) (Lepori, Cantoni & Rezzonico, 2005). The selection and adoption of a LMS by a teaching institution or a corporate training system follows the analysis of some basic parameters, usually including technical features (e.g., programming language used or required hardware infrastructure, etc.), available functions (e.g., discussion forums, integrated streaming services, etc.), supported formats (e.g., HTML, PDF, different video encoding, etc.) and learning technology standards compliance (e.g., SCORM). Such analyses (CVS, n.d.; FNL, n.d.; EDUTOOLS, n.d.) are mostly system-oriented, i.e., measure a definite set of features independent from the users, and only a very limited number of comparative studies on LMS actually consider other parameters (e.g., Botturi, 2004, which includes usability and Open Source community concerns). As members of the family of web applications, LMSs producers should care after *de facto* web design standards; in particular, they have to make their applications usable, as a distinctive feature of their quality for the user experience (Bolchini, Cantoni & Di Blas, 2003). According to ISO 9241 the degree of usability is based on “the effectiveness, efficiency, and satisfaction with which specified users achieve specified goals in particular environments” (ISO, 1998). Providing web users with a usable environment can lead to significant savings and improved performances (Donahue, et Al., 1999; Nielsen, 2003). In terms of teaching and learning, having a usable LMS means potentially reducing teacher time invested in setting up and managing the course and improving the students’ learning experience – teachers and learners do not need to struggle with difficult technologies but can focus on content. This paper reports the method and results of a comparative usability study conducted in 2004-2005 on four different LMS. The next section proposes some reasons for conducting a structured usability evaluation on LMS. After that we explain the methodology adopted for the study, and then we present and discuss its main results.

About LMS usability

Why is it useful?

Recent developments (Triacca et Al., 2004; Frick et Al., 2005) indicate that web usability is becoming an important issue for eLearning and for LMS development. A recent survey (Pulichino, 2004) shows that eLearning practitioners perceive usability a key factor in eLearning applications planning and use. The results of that survey indicate three aspects: (a) usability is an essential consideration when designing eLearning; (b) eLearning components should always be tested for usability; and (c) eLearning components effectiveness can be greatly enhanced through user-centered design methodologies.

From the perspective of LMS selection, adoption and maintenance, the investigating the usability of LMS can be very interesting also for at least three reasons:

1. It may reveal usability breakdowns and provide indications for enhancing the application itself, by creating workarounds or by fixing the code – a possible alternative with Open Source.
2. It allows LMS manager to create guidelines for course authors and instructors that are actually supportive for their practice and focus on their problems instead of being (only) general introductions to the tool.
3. It allows user-oriented instead of system-oriented comparison and assessment of LMSs.

Another relevant issue at stake in the present study is investigating if there are differences between commercial and open source LMS. If the motto “given enough eyeballs, all bugs are shallow” holds (Raymond, 2000; González-Barahona & Robles, 2003), it is likely that the continuous workings and refinements of a community would produce a greatly usable interface; on the other hand, it is also possible to suppose that a distributed design and implementation process as that of Open Source communities could lead to inconsistent interfaces – definitely, an interesting topic for a field study.

Usability methodologies

There are different methodologies for evaluating the usability of web applications. Basically they fall within two main categories: (a) usability inspection methods, and (b) empirical testing.

Usability Inspections methods, also called *expert review methods*, include a set of methods based on having expert evaluators instead of final users inspect or examine usability-related aspects of a user interface (Cato, 2001). The main systematic inspection techniques are: Heuristic Evaluation (Cato, 2001) and Cognitive Walkthrough (Brinck, Gergle & Wood, 2002). Empirical Testing methods, also called *user-based methods*, investigate usability through direct observation of a sample of users interacting with the application (Whiteside, Bennet & Holtzblatt, 1988). The most used techniques are Thinking Aloud and Contextual Inquiry.

Target LMS

This study focuses on four different LMS in order to make an overall comparative analysis. Moreover, two of them are commercial products (i.e., produced and sold by a vendor) and two are Open Source software – as mentioned above, one of our goals was in fact to assess if there is any relevant difference between these two types of applications.

The choice of LMS was made considering the availability of the applications to be tested and also trying to get the most representative ones on the market. The four selected LMSs are: WebCT Campus Edition 4.1, WebCT Vista 3.0, Moodle 1.4 and Claroline. In order to simplify the examples in these papers we only took examples using WebCT Vista and Moodle.

Method

MiLE+ is the evolution of the previous method called MiLE (Milano-Lugano Evaluation) (Bolchini et Al., 2003; Triacca et Al., 2003; 2004) and it is the fruit of common research performed by TEC-Lab (University of Lugano) and HOC-Lab (Politecnico of Milan). MiLE+ tries to blend some features of the methods presented above emphasizing strengths and minimizing drawbacks. In particular, MiLE+ is an experience-based usability evaluation framework for web applications that strikes a healthy balance between heuristic evaluation and task-driven techniques. Clearly MiLE+ is not only the sum of the more interesting characteristics of others methods, but it introduces a new conceptual approach and several tools. Indeed, MiLE+ proposes some general elements which help and drive the usability activities. These elements are *Scenarios*, *Heuristics* and the *Usability Evaluation Kit (U-KIT)*.

1. *Scenarios* are “stories about use” (Cato, 2001; Carroll, 2002), describing a typical user, one or more goals, and elements of the context of use (place, time, circumstances of use, etc.).
2. *Heuristics* are usability guidelines/principles that allow the evaluation of an application. MiLE+ provides two sets of heuristics that should help the evaluation: *Technical Heuristics* and *User Experience Indicators (UEIs)*. Technical Heuristics (organized in design dimensions) are a set of heuristics enabling to evaluate the design quality (in all its aspects) and to spot implementation breakdowns. *User Experience Indicators (UEIs)* refer to aspects of usability which cannot be evaluated by those who are not final users. In other words, User Experience Indicators allow anticipating the potential problems that end-users may encounter during their experience with the website.
3. A *Usability Evaluation Kit (U-Kit)* is a library of specific evaluation tools, which comprises a library of scenarios (User Profiles, Goals and Tasks) related to a specific domain, a library of Technical Heuristics and a library of User Experience Indicators.

The original MiLE (now extended to MiLE+) was first applied to eLearning evaluating the corporate training LMS of a big automotive company in 2004 (Triacca et Al., 2004). That experience and other minor experiences has allowed to develop it further in order to respond to the needs of eLearning.

Tasks, Scenarios and Heuristics

This paragraph presents the main elements of the implementation of MiLE+ for this specific study, i.e., the usability kit we developed.

LMS are application used in different ways by two main groups of people: teachers and students. Consequently, both inspection and user testing were divided into student view and instructor view¹. User profiles were specified as belonging to either group. We then developed macroscenarios, scenarios, goals and tasks for both groups, and then conducted separate inspections and user testing sessions. After the first analysis phase, still divided into groups, the data were put together in order to generate an overall view of each application.

In order to provide the flavor of the process, we present an example of tasks and scenarios. MiLE+ offers two levels of abstraction with respect to scenarios:

1. *Macro-scenarios* capture a general activity of a user group of achievement, which can be accomplished through several steps or macro-goals (Triacca et Al., 2004).
2. Each macro scenario is then specified into a set of *scenarios*, that provide additional detail and focus on a specific goal that the user can accomplish through a set of *tasks*.

For example, in the instructor view we defined the macro scenario in Figure 1a, labelled as macro-scenario 3.

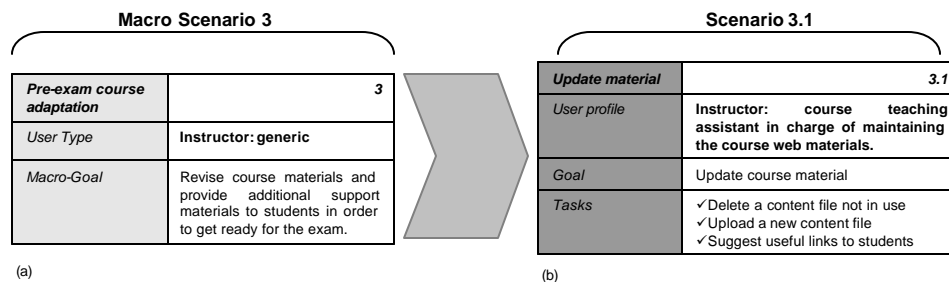


Figure 1 - Sample macro-scenario for instructor view

This was then refined into a set of scenarios, among which the one in Figure 2a, labelled as scenario 3.1. Scenarios include a specific user profile, a specific goal and the tasks required to achieve it.

During the Inspection, two experts used the application following the scenarios. They were given chooses some heuristics taken from the MiLE+ heuristics' library, which they used in order to structure their observation and to make them comparable. The MiLE+ heuristics library is organized in 4 main design dimensions (navigation, content, technology/performance and interface design) including 36 navigational heuristics, 8 content heuristics, 7 technology/performance heuristics and 31 interface design' heuristics, for total of 82 technical heuristics (Triacca, Inversini & Bolchini, 2005). According to the MiLE+ process, the results of the inspection were used in order to identify the most critical scenarios, goals and tasks, and these were then used to user testing. Nielsen (2000) claims that 5 users will yield 80-85% of all usability problems. Rubin (1994) is not so optimistic and advice for a sample of 10-12 users. This study involved 12 students and 9 instructors. During user testing the users were asked to use the application for achieving the selected goals thinking aloud, and were observed according to a structured protocol, that registered problems, doubts, and, in some cases, the inability to accomplish the goal.

Results

This study delivered interesting results concerning usability assessment and potential improvement for all target LMS. For reasons of space, they will not be presented here. The comparative analysis of the results also indicated three main points relevant to all those in charge of selecting, maintaining or promoting the use of a LMS within an organization. They can be framed as answers to the following three questions:

1. Is there a most usable LMS?
2. Is there a difference between commercial and Open Source LMS when it comes to usability?
3. If a LMS is poorly usable under some respect, is there something easy we can do about it?

Is there a most usable LMS?

The main question for a potential adopter of a LMS who is aware of usability issues is if the most usable LMS exists. The results of this study indicate that this is a bad question for which there is no single answer. Figure 4 collects the overall results of the study as histograms: graphs on the left-hand side present the

¹ Actually, administrators are another important user group, that was not included in this study.

results of the student view, those on the right the results of the teacher view. The first row shows the results of the inspections (average of scores on all tasks for each view); the second the results of user testing; and the third row the average of both. All values are reported on a 10-point scale.

The graphs clearly indicate that there is no “most usable” LMS, as differences in usability are minimal. From the students view, Claroline seems to work well, both in the inspection and in user testing, although the differences with the second LMA are 0.4 (WebCT CE in the inspection) and 0.9 (WebCT Vista in user testing). The other LMS are quite on the same level in both evaluation phases.

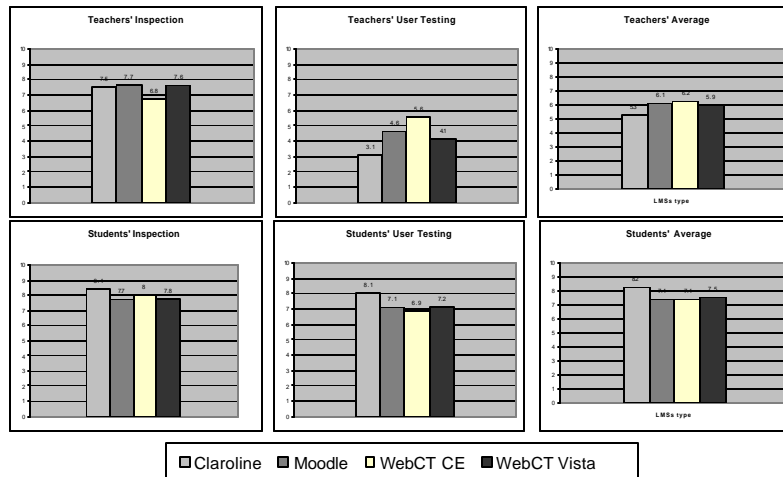


Figure 2 - Usability results graphs

From the instructor view, there is a big gap between inspection and user testing: users seems to perceive LMS as less usable than experts. In the inspection, all LMS have comparable scores, except WebCT Vista; in user testing differences are bigger, showing WebCT CE as first, Moodle as second close to WebCT Vista, and Claroline fourth. In order to draw a synthetic conclusion, all these results can be put together, generating a final usability value as the average of both student and instructor views. The outcome is in Figure 5: the final value presents almost no differences among the four LMS.

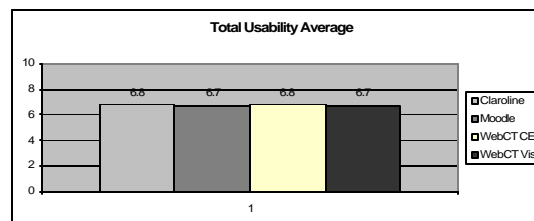


Figure 3 - Final usability scores

This seemingly “no significant result” data actually yield interesting implications for LMS adopters. The point is reformulating the question: what is the most usable LMS in *my specific context*? Let’s consider two different scenarios. An organization with thousands of students and far less instructors, such as an open distance higher education institution, will benefit from a strongly usable LMS from the students’ point of view (e.g., Claroline), it will then offer training to the instructors in order to balance the poor usability of the teacher’s interface. On the other hand, an organization with a low teacher/student ratio, such as a small campus-based university, might opt for a usable platform from the instructors’ point of view (e.g., Moodle).

Is there a difference between commercial and OS LMS when it comes to usability?

On the one hand, LMS vendors say that a well-structured and orderly software design and development process leads to good products, stable, usable and with consistent interface design. On the other, OS supporters claim that nothing can better take care of real users’ needs than having users developing their own products. As we already mentioned, this makes sense: (expert) users should be able to say what they

want, also in terms of usability; yet, too many cooks are going to spoil the cake – the often overlapping contribution of more developers might lead to inconsistent designs. In general, or results show that there is actually no significant difference in terms of usability. The overall scores of commercial vs. OS LMS do not differ much (cf. Figure 4). The difference is not more significant considering students or teachers view. Moreover, some similar usability problems can be spotted in both groups. Let's take one example: icons predictability should be one of the issues that first is fixed when a large community of users works on an application – yet, we find very similar problem both in WebCT Vista and Moodle. For example, Moodle offers two basic course structures: the weekly format and the topic format. Both formats organize the course main page in blocks. The student can choose if s/he wants to view all blocks at once or just one block at a time (and a drop-down menu to move from one block to another). The icon underlined in (Figure 6) allows switching from single-block to multiple-blocks view.

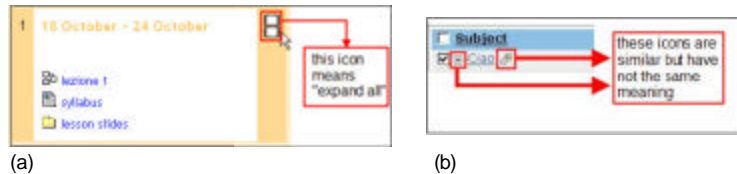


Figure 4 – (a) Icon for switching view in Moodle (b) WebCT Vista's forum expand options

At a first sight, the icon is rather unpredictable, and is placed in the upper-right corner, making it difficult to spot. Most users are actually unaware of this feature. In WebCT Vista we find a similar problem with some graphics in the message view. The first icon on the left in Figure 4a means “expand the thread”; the second one displays the thread with all messages. Their very similar meanings and look result in confusion on the user end due to scarce predictability. Of course this does not mean that having a commercial or OS LMS does not make any difference. It does from many points of view (e.g., concerning costs, maintenance, services, etc.), but, so far, it does not seem sensible to expect significant differences in terms of usability.

If my LMS is poorly usable under some respect, is there something easy I can do about it?

Fixing usability problems in Open source LMS requires programming, i.e., time and costs usually not affordable for teaching institutions, or contact and interactions with the community that maintains the application. With commercial LMS a fix requires issuing a formal request to the customer service that might take very long before being included in an official release. Unfortunately, this is the only way for fixing usability problems in the instructor's view. Nevertheless, instructors and designers can fix a good part of usability problems in the students view with some simple workarounds. Identifying them was one of the goals of our study, and showing them to those who create and maintaining online courses and materials is a simple but effective way to enhance students' online learning experience for LMS promoters. In order to show how this works, let's take first WebCT Vista. This LMS has a specific *Syllabus* tool, that allows teachers to create the course syllabus following a pre-defined yet flexible structure. This generates an HTML page, which can be difficult to print or save for students. A simple workaround would be using a DOC or PDF file instead of the Syllabus tool, a simple solution that would generate no additional problems for the teacher, no lack of features, and make printing and saving much easier for the students. Another simple but effective workaround can fix some annoyances in Moodle. This LMS allows instructors to make available a number of resources, among which single files, URLs, and file folders. Students can access resources from the course main page or through a special resource list page. In this list page, folders, and URLs are not distinguished graphically, but all links looks the same, diminishing the predictability of the link (cf. Figure 8: although looking exactly the same, “syllabus” leads to an HTML page, while “articles” to a file folder).

Week	Name	Summary
1	syllabus	course settings
4	articles	new articles can be found in the directory
7	Resource	
8	exercises	exercises for the preparation of the exam

Figure 5 - Moodle's resource list page.

This problem could be easily fixed by indicating in the resource title its type, such as “FOLDER: articles”, or “articles ::folder:”. The revision of the usability breakdowns identified in this study indicated that many usability problems can be solved with simple workarounds that adequate training can help to integrate into instructors’ and designers’ practice. Some of these simple tricks are already effectively in use at the eLab (www.elearninglab.org) in order to enhance the online learning experience of higher education students in Southern Switzerland.

Conclusions and future work

This study reported the questions, method and key results of comparative usability study of four LMS. The study bears a twofold focus on the student and on the instructor interfaces.

The results indicated that (a) there is no single most usable LMS, rather each LMS has different usability features that make it more suitable for specific contexts; (b) there is no significant difference in between commercial and OS LMS when it comes to usability; and (c) that some usability problems in the students’ interface can be solved with simple workarounds by instructors and instructional designers. Future work will consolidate these results by applying the same evaluation method to other LMS, both commercial and Open Source. An interesting issue put forward by the definition of workarounds is the relationship between usability and instructional design and development: how to produce an instructionally effective online support according to main LMS usability limitations and good practice usability principles? How to integrate usability concern directly in design, without leaving them to a post-evaluation or a second-thought? (an initial discussion can be found in Armani et Al., 2004). In general, we hope these results indicate that caring after usability is a primary concern for enhancing the online learning experience, and that evaluating usability is a sustainable task.

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