Evaluating Usability in Learning Management System Moodle

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Abstract. The electronic way of learning and communicating with students offers a lot of advantages that can be achieved through different solutions. Among them, the most popular approach is the use of a learning management system. Teachers and students do not have the possibility to use all of the available learning system tools and modules. Even for modules that are used it is necessary to find the most effective method of approach for any given situation. Therefore, in this paper we make a usability evaluation of standard modules in Moodle, one of the leading open source learning management systems. With this research, we obtain significant results and information's for administrators, teachers and students on how to improve effective usage of this system.

Keywords. Web usability, Moodle, Learning Management System, e-Learning.

1. Introduction

With the rapid increase of ICT infrastructures every educational institution has the opportunity to make use of the Internet as a communication medium with the students. For an effective and efficient access to learning materials, the concepts and methodologies of technology-based learning are increasing in importance with e-learning [1] becoming a crucial resource for institutions.

The advantages of e-learning as opposed to traditional learning are instantly evident with e-learning making education independent of time and location. More importantly, it opens up fresh possibilities for implementing pedagogical innovations in an environment where students are expected to function as active, independent, self-reflected and collaborative participants. In addition, e-learning assists teachers in the management of online courses, allowing them to create, add, modify, customize, and reuse digital content and learning objects.

The consequence to the advancements of web-based technologies is the development of powerful software systems, known as learning management systems (LMS), in order to enhance learning in a variety of environments [2]. Essentially, a LMS provides an automated mechanism for delivering course content and tracking learner progress. Despite the availability of a large number of LMS’s, the quintessential barrier to the successful deployment of technology-based learning is the lack of high-quality systems tailored to the needs of both individual users and groups. As a result, much of the construction of e-learning is still carried out without a true understanding of how learning theories can be translated into pedagogical requirements.

Learning management systems allow students to view multimedia lectures, communicate with their teachers and each other in learning communities, download course materials, take online quizzes and submit homework and classwork assignments. In addition, these systems are used for improving the internal faculty organization. The intricacies of these complex systems are resolved by including a lot of modules in their implementation. For example, teachers can create lessons with specialized lesson tools, or they can create them in web-ready HTML form with multimedia data. In such a scenario, both users and teachers can become confused as to which are the proper modules to use for accomplishing the intended goals. If the system has 15 modules, is using all 15 modules appropriate for any given situation? If the teacher uses every available feature, will he and the students have enough time to concentrate on the process of learning? Even if only selected modules are used, the variety of courses offered at a university might create a different learning environment for each course,

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thus causing confusion in the users. All of these reasons are a motivation to evaluate the usability of e-learning modules in Moodle [3] LMS and create a selection model for module use that proposes to both teachers and students which modules to use.

There have been several efforts to develop frameworks for analyzing learning management systems from pedagogical and institutional perspectives [4,5]. Mainly, these frameworks and methods are for general usability testing of e-learning systems and they are vaguely used in our evaluation. Only a few studies focus on usability analysis of Moodle; where some analyze specific modules [6,7] and some compare Moodle with another LMS [8,9]. In this paper we want to evaluate the usability of different modules in Moodle and compare the user experience with different group of modules in order to find the most suitable e-learning environment.

Initially, in the following section we will describe the need of usability in e-learning systems. Furthermore, in section 3 we explain why Moodle is the choice for this LMS usability evaluation and then go on to describe the methods used in Section 4. In Section 5 the usability analysis results are presented and conclusions are drawn as to the proper way to use Moodle to create usable LMS. The article closes in Section 6 with a summary of the study and plans for future work.

2. Defining Usability

Usability testing has long been a part of the software design. The international standard ISO 9241-11 uses the following definition: “[Usability refers to] the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of user.”

To properly define usability as it has evolved during the past few years, two original approaches have to be included. Jakob Nielsen brought the concept of web usability [10] by stating that making web pages simple to navigate and intuitively organized, helps the users find the information they're looking for with ease. A further refinement create the term “learnability” [11] which is highly recommended in evaluations of e-learning environments. In the world of e-learning, the definition of learnability is expanded to include the ability of users to effectively learn and retain the skills and knowledge.

To examine the usability of e-learning systems various methods can be employed such as questionnaires, individual interviews, expert reviews, online surveys, personas etc. [12]. In case of educational software, additional principles become important, such as the design of learning objects and learning activities, presentation medium and communication between students and teachers.

3. Choosing LMS

3.1. Standardized Development

There are six major advantages [13] in standard development and use, specifically in the field of e-learning: interoperability, accessibility, reusability, durability, maintainability and adaptability.

The systems along with the contents, data and processes they manage must conform to the above mentioned characteristics. The most established specification is developed by Advanced Distributed Learning (ADL) organization and it is named SCORM [13]. The SCORM specification combines elements of IEEE, AICC and IMS provisions in one document that can be easily implemented in the system. Also, ADL includes additional values to the existing standards with well defined examples and frameworks. In [14,15] we made more detailed research of the SCORM model, while in [16,17] we developed a prototype of a system which implements SCORM.

3.2. Approaching LMS

Before implementing Moodle, our e-learning environment consisted of using: different Yahoo and Google groups for each course, bulletin board on our web site for announcements, different web applications for exams and for internal organization of course and curriculum related events. The materials from both teachers and students were distributed in different forms on numerous ways. Therefore, a decision was made to implement LMS in order to solve the disparities in teacher-student communication. The learning environment at our university presents different targets and constraints for implementing such kind of e-learning system due to the fact that there are ten faculties where
students have a varied knowledge in using web portals and information technology.

We made a study analysis of 7 well known open source SCORM compatible LMS. It was necessary to use the advantages of open source software and the SCORM model to create the most efficient and standard based learning environment as this is the most apposite choice. Open source systems are developed, upgraded and used by universities as scientific projects, from teams which are most competent and accomplished in the learning area. They are also highly customizable and are very easy to localize. On the other hand, most commercial LMS’s are culture-specific, and closed off to customization by proprietary licenses. With implementing standards, systems can exchange course data between them and if a change in LMS occurs, then the data can be transferred efficiently.

ATutor[18], Ilias[19] and Moodle were shortlisted as learning management systems developed in sufficient detail appropriate for analysis. All of the systems were installed and with preliminary user testing that included students, Moodle was chosen as the most adequate solution. One of the reasons is that only Moodle have Macedonian translation.

Today almost 38,000 sites with 16,000,000 users [3] are registered that use Moodle. This system contains modules (activity tools and blocks) that enable the base things for e-learning, for example: multimedia learning contents, events, news, forums, questionnaires, questioning, chat, e-mailing, wiki etc. The open source community offers many additional modules, built from different publishers, which can be added to Moodle. This study analyses all of the activity tools and blocks included in the default installation.

4. Usability Evaluation Methodology

4.1. Procedure

Our evaluation is based upon the experience-based evaluation for web applications that offer a balance between heuristic evaluation, questionnaires and task-driven techniques [12]. The goal of heuristic evaluation [20] is to find usability problems early in the design of courses and setting parameters of the system so that improvements can be made as part of the iterative design process. Heuristic evaluations are usually conducted by a small set of evaluators with the result being a list of potential usability issues or problems. With usage of questionnaires and task-driven techniques [5] the users express their opinion about usability of modules.

Eighty four students participated in the study on a voluntary basis. Most of the participants were second and third year students, 20 to 22 years old, (profile given in Table 1) from the Faculty of Informatics and the Faculty of Economic Science. Also four university professors, four teaching and research assistants (in Moodle are named as teachers and course creators) and two system administrators were involved.

**Table 1. Students profile**

<table>
<thead>
<tr>
<th>Sex</th>
<th>Faculty</th>
<th>Experience with Internet tools</th>
<th>Experience with LMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>F</td>
<td>F</td>
<td>E</td>
</tr>
<tr>
<td>54</td>
<td>30</td>
<td>47</td>
<td>37</td>
</tr>
</tbody>
</table>

In this study, we consider four developed courses in which the previously mentioned activity tools and blocks are included. The teachers (also course creators) create courses and set course parameters. After that, they add lessons using the HTML editor and add different types of multimedia data (flash animations, sounds) and conclude with creating activity tools and putting blocks into the courses. During the creation process the course creators have the task to notice the usability advantages and disadvantages inherent in the system. At the start of the study, each student got a detailed plan on how to use the system, where the test phases were divided into three periods: first week, second week and from second week to the end.

4.2. Moodle Modules

Our goal was to analyze modules for different purposes, like learning, synchronous and asynchronous communicating, testing, assignment submissions.

Modules are divided into three categories: activity tools, blocks and filters. We decided to analyze standard modules in Moodle. We obtain 11 activity tools: Lesson, HTML page, Glossary, Assignments, Quiz, Choice, Database, Workshop, Wiki, Chat and Forum. Also we analyze nearly 25 blocks (People, Calendar, Online Users, Latest News, Upcoming Events, Search, etc.). Each of these tools was
implemented with different variations into the four courses. The Filters was used as associated components to the activity tools and the blocks.

4.3. Data Collection

Each student had a task to complete three questionnaires with different types of questions (multiple choice, scaled-answer and open-ended questions, and different task to do). Study-specific questions and tasks were composed, mostly combinations from many well known abstract tasks, questionnaires, checklists for testing usability of e-learning systems [21, 22, 23, 5].

Questionnaire A was delivered after one week of using Moodle. The goal of this questionnaire was to collect preliminary impression of the system, and concerns on the user interface (and design) of the system and different modules. Questions about browser representation of modules in a varied system environment (different operating system, different resolution, and different browser) were also included.

Questionnaire B was given after two weeks of working with the system. The user had to complete easy tasks such as open chat, upload/download files etc. After the second questionnaire, students take tasks to complete and to answer the results in Questionnaire C, which was delivered at the end of data collection phase, after the sixth week.

5. Results

The results of our analysis are recommendations to all teachers and students, as to which modules to use and in what way. By implementation these recommendations, in a deployed LMS it will have a compact and coherent implementation of Moodle. As mentioned before, the results are based upon questionnaires A, B and C, and then improved by experts analysis of the system. The summary of the study is presented below.

5.1. General

General setting applies to the whole system. As conclusion of questionnaire C, five questions and their responses were given as assessment of the factors associated with usability: ease of use, efficiency, effectiveness, memorability and satisfaction. Users grades the factors from 1 (strongly agree) to 5 (strongly disagree). The results are shown on Figure 1. We can see that Moodle have good usability rating for each property.

![Figure 1. Students rating of Moodle usability](image)

The average rating of each property, mean and standard deviation are shown in Table 2.

<table>
<thead>
<tr>
<th>Property</th>
<th>Average</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ease of use</td>
<td>1.91667</td>
<td>0.173744</td>
</tr>
<tr>
<td>Efficiency</td>
<td>1.869048</td>
<td></td>
</tr>
<tr>
<td>Effectiveness</td>
<td>1.761905</td>
<td></td>
</tr>
<tr>
<td>Memorability</td>
<td>2.22619</td>
<td></td>
</tr>
<tr>
<td>Satisfaction</td>
<td>1.988095</td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>1.952381</td>
<td></td>
</tr>
</tbody>
</table>

In this part we give summary of usability problems defined by students and teachers. Students defined 48 unique problems and the evaluators 63. Combined, there are total of 75 unique problems. Although the number of students was bigger than evaluators, they define smaller set of problems. In [24] Nielsen states that users are not so good at identifying problems. As can be seen 84 students identify 64% from all problems and 4 experts 84%.

Next are shown most significant issues about usability in Moodle. Initially, the suggestion from participants is to focus on system promotion. Many users are familiarized with Macedonian translations of open source software (79%) therefore the default language of the system is Macedonian, while English is also available. Users employ Cyrillic encoding when utilizing the system. Students (48%) and teachers (88%) choose Cornflower theme as representative theme.
Users chose the most important elements to construct the information architecture on the front page (Figure 2). This includes the placement of Faculties and Courses on the left, logo with contact email for the system on the top right, and calendar and online users on bottom right. With this layout, user instantly can see related events or to ask for help by sending an e-mail to the system administrator.

Lessons, besides text, can include links, images, and flash animations; these objects being understandable to almost every user (98%). Materials which are added to the course must be in .doc, .xls, .pps, .jpg and .pdf format. These formats are selected by 82% from the users as a default file formats. If teachers or students have file in other format, they must convert it first and then upload on the system.

Teacher can use the module Choice. The choice of this module proves to be good for both sides, because teachers can analyze student opinion on various issues such as: when to take exam, which software to use etc.

Another course option is Wiki, so students can add their own materials or examples. Although 17% from students are aware of Wiki software, teachers think that it is a great opportunity for students to put forth their own knowledge.

5.2. Authentication

Both, the results from the users and evaluation of experts, give the same suggestions about user authentication. Every student should be allowed to become a user of the system. The teacher’s grants access privileges to the courses he manages and sends e-mail to announce course membership and system information. For copyright and security reasons, guest user is disabled.

5.3. Learning Materials

All teachers choose to organize lessons by subjects. Lessons are created as Resource (HTML), although they can be created as Lesson, due to the fact that 66% of teachers encounter complications when creating Lesson objects.

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5.4. Assignments

Important and integral parts of an effective LMS are assignments. The students will be required to upload and submit their work via the Internet, but assignments can also involve both on-line and off-line tasks (ex. Quizzes).

This aspect proved most difficult for students and teachers, because it significantly departs from traditional learning methods. Nevertheless, a brief user self-training session consisting of submitting several tasks results in both sides seeing the advantages of using assignments and quizzes.

More than 68% of users choose module: Advanced uploading of files, for uploading files. The modules Upload a single file and Database are disabled, since the first is seen as trivial and the second is viewed as complicated. Students can upload files in the default file formats mentioned before.

If the student assignment is to write text such as homework or a seminar paper, they must use the styles from the template which is located on the system (in .doc format), which is standard for all courses. For offline activities, teachers can use module: Offline activity.

The module Quiz is used for testing students. Due to the difference of opinion about this tool the recommendation is to use: Multiple choice and Essay, as type of questions. Since 70% of the students find them easy and good for checking knowledge.
5.5. Communication

Moodle uses well known e-tools for communication: online chat, forum, e-mail. Some of these modules are not well developed with 80% of students having significant problems with features of online chat. The module Discussion forum is also lacking by not possessing many features of the standard forums. Instead of discussion forum, teacher should place link to the official student forum.

6. Conclusion and Future Work

This paper discussed the usability of Moodle learning management system. By employing different usability testing techniques, Moodle was tested as a system, and as individual modules. The results provide quantitative and qualitative data that along with expert opinion presents recommendations to all users of the system: administrators, teachers and students. The implementation of these recommendations, results in a compact and coherent user friendly Moodle.

Future work will include a wider testing audience including students with different profiles. Our work will continue the usability test in search for an improved user experience with Moodle.

7. References