Paper cite info: E. Koulocheri, E. Chatzidaki, A. Soumplis, M. Xenos, "A Usability Evaluation Approach in E-Learning Environments: The Case of IBM Lotus QUICKR", International Conference The Future of Education, 2nd Edition, Frorence, Italy, 7-8 June, 2012, Volume II, pp. 48-53.

A USABILITY EVALUATION APPROACH IN E-LEARNING ENVIRONMENTS: THE CASE OF IBM LOTUS QUICKR

Eleni Koulocheri, Eleni Chatzidaki, Alexandros Soumplis, Michalis Xenos
Software Quality Research Group,
School of Science and Technology,
Hellenic Open University
Greece
ekoulocheri, echatzidaki, a.soumplis, xenos {@eap.gr}

Abstract

It is widely accepted that learning environments can enhance the management of learning and contribute to the knowledge transfer [1]. Nowadays learning environments are used in schools, colleges, universities and lifelong learning platforms are independent from the subject area. Such environments compose of various features and services which allow users to collaborate, share knowledge, exchange information, data, experiences and generally to support formal and informal knowledge. According to Human Computer Interaction (HCI) aspects, a usable learning environment is more effective and efficient in terms of learning management and knowledge transfer. Therefore, usability evaluation of learning environments is an important procedure in order to ensure the three main aspects of usability; effectiveness, efficiency and subjective satisfaction [2]. Mainly, in the case of a distance learning university several innovative learning environments are used. This study presents an evaluation process of the learning environment IBM Lotus Quickr, used by Hellenic Open University (HOU). HOU is the sole Greek university that provides distance education in undergraduate and postgraduate level. HOU applies contemporary educational methods which are rely on the principles of distance education and offers innovative distance learning environments and social networks in order to achieve its purposes. IBM Lotus Quickr environment, as a Web 2.0-based team collaboration software for knowledge sharing and collaboration, is used by students and teachers of HOU and supports several activities which are critical for the educational procedure. More specifically, the platform allows users to communicate with each other, to be informed and administrate issues related to academic activities and access to information and additional material through a content repository. The evaluation methodology chosen in this study is an extended version of Heuristic Evaluation (HE) method suggested by Nielsen and Molich [3]. The HE is combined of 10 heuristic rules that provide efficient coverage on major usability problems of web-based user interfaces. Since HE list is dynamic, it can be modified according to the needs of the software under evaluation. Therefore, the method presented in this paper is based on the aforementioned 10 heuristic rules enriched with 5 additional heuristics specifically created for such educational environments, taking into consideration various former studies [4 5, 6, 7] using heuristics. In this paper, the methodology applied to IBM Lotus Quickr is described, the whole evaluation procedure is presented and the evaluation results and outcomes are discussed.

1 Introduction

Hellenic Open University, in the context of providing distance education through innovative methods and activities, uses a number of learning environments. The presented platform in this study is the IBM Lotus Quickr, which is an environment that provides information about courses, classes, students'

projects of HOU and is based on the distribution and collaboration of learning content and activities. In this paper, the IBM Lotus Quickr educational platform, the usability evaluation experiment and its results are presented. IBM Lotus Quickr as every educational environment which is used for educational purposes should be ensured that supports learning efficiently, effectively and through a usable way. In order to ensure that, a usability evaluation was applied to the platform aiming to reveal any usability issue that affect users' interaction, using an extended version of the widely known heuristic evaluation. The extension includes the 10 heuristic rules proposed by Nielsen and Molich [3] enriched with 5 additional heuristics specialized for educational platforms, which were created by considering various studies based on heuristics.

2 LMSs and Usability

The evolution of online distance learning is tightly connected with the evolution of online tools used for creating, distributing and managing digital learning content in order to assist the delivery of educational material and services to learners participating in distant learning activities. This kind of software is referred to as a Learning Management System (LMS) and offers a much wider range of tools and services to support education and learning and recently shifts towards more participatory environments according to the Web 2.0 attitude. Moreover LMSs are a collection of modules with many of them with the aim to extend the environment functionality beyond the delivery of learning material. The trade-off can be an inconsistent environment which can have negative effect on user experience and -while the primary goal of an LMS is educational- usability issues, poor features, ineffective procedures cannot be overlooked as they lead to disappointment and frustration. Thus, since the LMSs are the medium for the achievement of the goal which is learning and knowledge transfer in an effective and efficient way, those systems should be evaluated under the perspective of software quality metrics. So focusing on the medium, usability issues should be isolated from learnability issues as usability in learning interfaces concerns the way the content is presented and not just the content solely [14]. Furthermore an instructional interface should allow the user to focus on learning content rather than focusing on how to access it.

3 The IBMQuickr Environment

According to IBM, the owner of IBM Lotus Quickr, "*IBM Lotus Quickr is team collaboration software that can help you access and interact with the people, information and project materials you need to get your work done*". Besides the official features and benefits, there are: content libraries, team places, content repositories. The Hellenic Open University (HOU) has installed it from its first years and nowadays, the IBM Lotus Quickr is provided in 230 different instances, one for each thematic course that the HOU offers. The main purpose that this system serves is the organization and management of the class issues, such as the provision of academic schedule, announcements, and forum. In many courses, it is used in parallel with other educational environments, such as Moodle, but it is the basic and official environment for all courses. The following picture illustrates the home page of the course "PLH42".

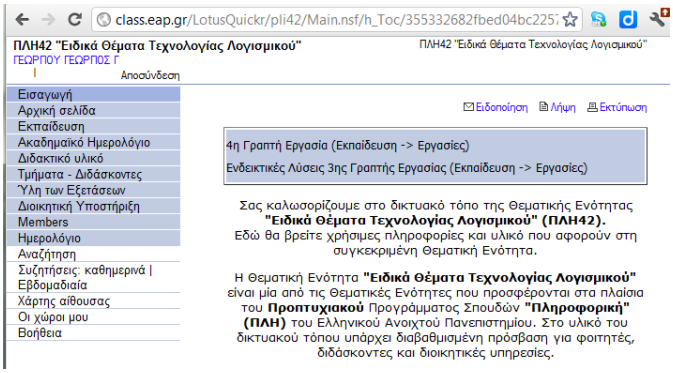

Fig.1. Home page of PLH42 course in IBM Lotus Quickr Environment

4 Usability evaluation

4.1 General

According to ISO 9241-11 [13], usability is "*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 use*". This definition includes three basic factors: *Effectiveness* that measures the level of the accuracy and completeness with which users achieve specified goals, *efficiency* that evaluates the resources expended in relation to the aforementioned accuracy and completeness with which users achieve goals, and *satisfaction* that investigates the level of the freedom from discomfort, and positive attitudes towards the use of the product [8].

According to Nielsen [9], the following five parameters describe usability:

1. Speed and easiness of learning the system.
2. Efficiency to use.
3. Easiness to remember after some period of not having used it and level of memory load required for that.
4. Low user error rate and easiness to recover from them.
5. Users' subjective satisfaction.

Usability evaluation may be conducted with a number of methods that require various resources; in field or in lab evaluations, different number of users, various levels of skills and various phases of software life-cycle. For IBM Lotus Quickr, the applied method was heuristic evaluation a method that requires relatively low resources, and thus is often called "discount method" [9]. The method is based on a set of rules or general principles or guidelines that critique a taken decision or guide a design decision. All these rules or principles or guidelines are called heuristics. The method includes a structured critique of the system, following these heuristics.

According to Nielsen, a number of 3 to 5 usability experts acting as evaluators can reveal 75% of the usability problems of the system. These evaluators critique it, inspecting the compliance of the system with the established usability heuristics.

4.2 The method applied

Heuristic evaluation generally is conducted in two phases [8, 10]:

a. Overall inspection: The evaluator is asked to freely navigate within the system for approximately 10 minutes in order to get familiarized with the interaction flow and the general scope of the system.
b. Focused inspection: The evaluator holds a scenario with specific tasks given by the coordinator and he asked to follow it. During the execution of each task and while the evaluator goes through the interface several times, he inspects various dialogue elements. Being already aware of the list of heuristics, he compares the system's behavior and each time he notices a violation of them, he writes it down in an evaluation form.

Nielsen and Mack [11] proposed a list of 10 basic heuristics of general usability scope that fit into a wide range of web-based systems and can reveal the most common usability issues.

1. Visibility of system status
2. Match between system and the real world
3. User control and freedom
4. Consistency and standards
5. Error prevention
6. Recognition rather than recall
7. Flexibility and efficiency of use
8. Aesthetic and minimalistic design
9. Help users recognize, diagnose, and recover from errors
10. Help and documentation

According to experts in the usability field [8, 9, 10] this list can be transformed depending on the domain of the system under evaluation. Hence it is considered as a dynamic list and in order to adopt the features and the nature of the system under evaluation, the aforementioned list has been enriched with five additional heuristics (specifically created for the usability of e-learning environments). These five heuristics have been designed taking into consideration a number of evaluation studies using various heuristics [4, 5, 6, 7] and has already applied in learning environments of HOU, such as LAMS and HOU2LEARN:

11. Customization of the content and platform*:* The content should be displayed through multiple ways, while permitting user to easily customize it, according the user needs. Ideally, content should be provided with alternative structures using meaningful representations and metaphors that will make the transition from one structure to another with a clear way. The platform should allow user to change the environment settings and to apply his personal "look and feel". Furthermore, this heuristic judges if the platform allows user to edit and manage his personal profile efficiently, getting user aware of what is published to whom.

12. Navigation: This heuristic rule judges the navigation within the platform and how clearly this is conducted. User should be able to move in previous pages and to know where he is and all the options for the movement to next pages. Navigation fidelity should also be taken into consideration, checking the real world elements' representation or avoiding attention distraction and complicated options that may disorient user interaction.

13. Interactivity with content and peers*:* The platform should ensure a seamless interaction between user and the content, and this should be conducted with a clear and pervasive way. The content should be visible, easily manageable, and easy to be jointly constructed if the system supports it, encouraging collaborative learning among learners. The system should allow flawless communication and interaction among users, ensuring the feeling that the user deals not only with the content but with community of users ready to share learning material or learning experiences.

14. Tools and Multimedia integration: In case that the platform supports new tools' installation, it should allow user to manage them and change their location as desired. In addition to that, the platform should permit user to export data with an effective and efficient way.

15. Role management: If the platform supports different roles among the users and switching of them, this should be achieved with a clear way. The tutor will be able to view content as he was the learner. This heuristic also inspects if these roles are discrete and if the access to content is provided easily and according each role.

4.3 The Experiment

Five evaluators participated in the evaluation procedure; three of them had more than seven years scientific experience in usability and the rest of them had significant experience in the domain of heuristic evaluation. Aiming to avoid any biased results, it was by intention that nobody of the evaluators had any previous relationship with the IBM Lotus Quickr environment in regards to setting up or previous interaction. Before the evaluation, the coordinator of it made an oral presentation of the environment and gave all the evaluators a scenario that would last about two hours.

The evaluators were asked to follow the scenario tasks and to validate the application of each heuristic rule. Every time that a rule was violated, the evaluator should filled the evaluation form respectively, noting the violation description, the scenario task that lead to the violation and the violated rule. The five evaluators reported a total of 109 usability problems that lead to 145 violations of the heuristic rules. But these violations are not unique; 58% of the reported problems were reported by more than one evaluator. After the removal of duplications and considering duplicated problems as a single one (58% of the reported problems are reported by more than one evaluator), the aggregation of all evaluation forms lead to a total number of 46 usability problems that provoked 100 violations of the heuristic rules. The correspondence is depicted in table 1.

Table 1. Number of violations per heuristic rule.

Heuristic Rule	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Number of violations	7	21	4	10	16	9	3	6	3	4	4	13	0	0	0

The major violations reported included (corresponding rule in parenthesis):

- No confirmation when they tried to send a message to other users (1).
- Term such as "Room Index" with no clear meaning, and term with confused meaning such as "Introduction" and "Starting page" (2).
- Lack of standard buttons such as "Back" (3).
- User actions in a pop up window affect the background initial window (3).
- Not consistent menu format (4).
- Many options were hidden (4).
- Standard buttons such as "Logout", "Search" have been placed in not usual locations (4).
- No warning message on logout (5).

- The system didn't preserve data when the evaluator pressed the "Previous" button if some forms (5).
- Memory load was required for a number of actions (6).
- Confusion of the usage of terms such as "Next" instead of "Save" and the unclear role of the "Room index" button, limited user flexibility and provoked them disorientation (7).
- The sidebar menu on the left there is a set of heterogeneous items including services and help related buttons that provoke confusion (8).
- The logout button is hidden (8).
- Improper design of the (single) sidebar menu and almost hidden submenus (8).
- Improper error messages such as "error: return and try again" (9).
- The "Help" navigation menu was so large that actually was useless (10).
- The "Search" field" didn't work for search with file names (10).
- The access and the customization of the content was affected by the wrong usage of terms in the menu (11).
- Lack of "Back" button in many cases (12).
- Some standard navigation buttons, e.g. "Previous", "Next", when appeared, were referring to the current active module and not to the entire course (12).
- Lack of path or breadcrumbs does not permit evaluators to know their location within the system (12).

5 Conclusions – Future Goals

The presented evaluation clearly showed the need for improvement, so the next steps include the further evaluation of IBM Quickr through user testing; potential users will execute a predefined scenario and the entire scenario will take place in a usability evaluation laboratory where a camera and an eye-tracker will track the user actions and reactions. The comparison of both heuristic and experimental evaluations will provide valuable feedback on the heuristic rules applied for the evaluation of the assessment of a learning tool. On another note, the integration of the results to these ones that occurred from the heuristic evaluation of three more learning environments adopted by HOU: Moodle, LAMS and HOU2LEARN, will be performed. Notable combinational conclusions are expected to arise. These conclusions will help the re-parameterisation and improvement of IBM Lotus Quickr aiming to address the needs of HOU users with a usable and optimal way.

References

[1] Beth, D., Carmean, C., and Wagner, E., (2009), "The Evolution of the LMS: From Management to Learning, Deep analysis of Trends Shaping the Future of e-Learning", The eLearning Guild Research, 2009.

[2] ISO, (2003), "Ergonomic requirements for office work with visual display terminals – Guidance on usability", ISO 9241-11, 2003.

[3] Nielsen, J., and Molich, R., (1990), "Heuristic evaluation of user interfaces", Proceedings of the SIGCHI conference on Human factors in computing systems, pp. 249-256, 1990.

[4] Norman, D.A., (1994), "Thinks that make us smart – Defending human attributes in the age of the machine", Perseus Books.

[5] Reeves, T., Benson, L., Elliott, D., Grant, M., Holschuh, D., Kim, B., Kim, H., Lauber, E., Loh, S., (2002) "Usability evaluation and instructional design heuristics for e-learning evaluation", In Proceedings of World Conference on Educational Multimedia, Hypermedia and elecommunications 2002 (2002), pp. 1615-1621.

[6] Schunk, D.H., (2000), "Learning Theories: An education perspective" (3rd Edition), Englewood Cliff, NJ: Prentice Hall.

[7] Squires, D., Preece, J., (1999), "Predicting quality evaluation in educational software, Evaluating for learning, usability and the synergy between them", Interacting with Computers, Elsevier, 11, 1999, pp. 467-483.

[8] Dix, A., Finlay, J., Abowd, G., Beale, R. (2004), "Human-Computer Interaction", 3rd Edition, Pearson – Prentice Hall.

[9] Nielsen, J. (1993), "Usability Engineering", Academic Press, London.

[10] Sharp, H., Rogers, Y., Preece, J. (2006), "Interaction Design", Beyond Human-Computer Interaction, 2nd Edition, Wiley.

[11] Nielsen, J., Mack, R.L., (1994), "Usability Inspection Methods", John Wiley & Sons,Inc., New York.
[12] IBM Lotus Quickr, http://www-01.ibm.com/software/lotus/products/quickr/ Retrieved: 21/2/2012
[13] ISO 9241-11 (2003). Ergonomic requirements for office work with visual display terminals – Guidance on usability, 2003.
[14] Feldstein, M (2002), "Tutorial: What is "usable" e-learning?", eLearn Magazine, Volume 2002, Issue 9, Page 2, 2002.