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A Usability Study Of An Online Instructional Multi-Media Discussion Environment

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Abstract

The present study aims to evaluate the usability of the Online Instructional Multi-Media Discussion Environment which was developed in the Department of Computer Education and Instructional Technology (CEIT) at the Hacettepe University as part of a doctoral thesis. The study was designed as a case study and conducted with 56 CEIT senior students. The results of the research are considered to be significant as they could both help the people responsible for the design of sites and their contents, and form the basis for further usability studies in order to develop online instructional multi-media discussion environments.

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1. Introduction

Usability studies are important for the design and development of software. Testing whether the users will like the developed environment helps prevent potential problems since the process determines existing problems within the system during the design process stage.

Usability tests aim to determine the problems on user interfaces which may result in human error, loss of interaction and complications. Moreover, they also aim to reduce the duration of education while at the same time increasing performance, efficiency as well as user satisfaction (Norman and Panizzi, 2006).

There are many methods used to test Web site effectiveness such as online browsing, focus groups, personnel analysis and usability tests (Augustine and Greene, 2002).

Web site evaluation processes are more efficient with the help of usability tests. Rubin (1994) describes a usability test as a body of processes/transactions which uses representative participants in order to determine whether a product meets its special use criterion. Therefore, the problems of the web site are determined, thus enabling a user-oriented site design (Rubin, 1994). This is also important in as much as the tests enable the user to get used to the web site and to use it more often, thus contributing to his/her satisfaction (Rubin, 1994).

Expert analysis is also very important, alongside tests including user participation, in order to evaluate the usability of a product. Dix, Finlay, Abowd and Beale (2004) examined usability evaluation methods under two categories. These are expert analysis and evaluation including user participation. Expert analysis includes methods

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such as the cognitive walkthrough, heuristic evaluation, model-based evaluation and the use of previous studies in evaluation. Evaluation including user participation involves empirical methods (experimental evaluation), observational techniques, query techniques and evaluation through monitoring physiological responses.

The usability methods used within the present study are the heuristic evaluation and cognitive walkthrough methods. In the heuristic evaluation method, the human-computer interaction experts evaluate the product according to some principles and in line with their own perceptions. The most popular and common principle is heuristic as suggested by Nielsen (Nielsen, 2005). In the cognitive walkthrough method, an expert puts him/herself in the user's shoes and evaluates the usability of the product (Çağiltay, 2011). Using this method, the experts use the product within a given scenario and try to determine the possible problems.

Today, as the Internet becomes more and more important in daily life, the number of people using online environments has increased. Online environments are used not only for marketing, promotion and communication, but also for education. All kinds of internet-based teaching and learning processes can be described as online learning (Long; cited in Küçük, 2010).

If learning is considered to be a dialog consisting of inner and social conversations (Jonassen and Land; cited in Hrastinski, 2009), some additional tools are needed in order to enable learning through inner and social dialogues, and to access other individuals and content in online learning media. A tool enabling the above-mentioned features is the online environment. Discussions on these online learning environments have a great effect on learning (Wu and Hiltz, 2004). Online environments are called discussion groups, message panels, discussion panels or online forums in the relevant literature. Participants can leave a message, read the responses or just read the messages sent to him/her on such online environments.

Software such as Moodle, Blackboard (Jeong, 2006) and WebCT (Nagel, Blignaut and Cronje, 2009) are used in studies examining participation in online environments. Moreover, some researchers have developed different software for participation, e.g. Moore and Marra (2005) examined an environment which used two different (guided, formal) participation protocols. However, the students do not have any other options apart from commenting or reading on these environments. As a result, an online learning environment was developed in the Department of CEIT at the Hacettepe University in order to enable more effective and efficient learning. The developed environment enabled the learners to write, add audio-visual content, make comments and read existing ones, watch (pictures or animations) and listen to the content.

The present study aimed to determine the usability problems of an online multi-media learning environment which was developed in order to eliminate the limitations resulting from not being able to use multi-media environments.

1.1. Research Problem

Two problems were determined within the scope of the usability study.

1. What are the problems determined by the cognitive walkthrough method on the developed environment?
2. What are the problems determined by an heuristic evaluation method on the developed environment?

2. Method

One of the qualitative research methods, the case study method, is used in this study. The participants were asked to evaluate the Online Instructional Multi-Media Discussion Environment which was developed by the Department of CEIT at the Hacettepe University via cognitive walkthrough and heuristic evaluation methods, and to make usability evaluation reports. Data obtained through this process was analyzed.

2.1. Study Group

One of the purposeful sampling methods, the probability sampling method was used. The study group consisted of senior CEIT students using the developed environment. There were 56 students in the study group (35 males, 21

females). The participants had taken the Human-Computer Interaction lesson in their undergraduate curriculum and conducted applications regarding the evaluation of the usability of different media. Therefore, the participants were considered to be partly qualified and were thus included in the study.

The study group was randomly distributed into two groups; one group evaluated the usability of the environment via the cognitive walkthrough method while the other evaluated it via a heuristic evaluation method. The cognitive walkthrough group consisted of 30 students (20 males, 10 females), and the heuristic evaluation group consisted of 26 students (15 males, 11 females).

2.2. Implementation

The members of both groups conducted their tasks individually in the computer laboratories. The cognitive walkthrough group was set tasks of working through a certain scenario. The heuristic evaluation group was not assigned any particular task, and they were asked to use the environment as they wished. At the end of the laboratory procedure, completed evaluations were handed in, and the incomplete ones were then given to the researchers.

2.3. Data Collection

Eight tasks were prepared for the cognitive walkthrough group in order to determine usability problems (Table 1). Tasks were chosen from among the processes and transactions on the environment. Independent tasks were chosen so that different menus on the site could be used. However, the heuristic evaluation group did not follow a certain walkthrough and they examined the environment using the heuristics of Nielsen.

All tables should be numbered with Arabic numerals. Headings should be placed above tables, underlined and centered. Leave one line space between the heading and the table. Only horizontal lines should be used within a table, to distinguish the column headings from the body of the table. Tables must be embedded into the text and not supplied separately.

Table 1: Tasks of the cognitive walkthrough group

<u>Tasks</u>	
1	Add an avatar and a picture on your profile. Edit your personal information.
2	Find the most recent comment on the environment.
3	Download the project presentation “Now We’re Schoolchildren” in the Our Projects theme.
4	Find all the comments of a user on the environment.
5	Click on the lesson of teaching application and find the learning material “The Adventures of Lala-1 (beginner)”.
6	Find the link “Start a new conversation” in the comments theme.
7	Add a new theme under human-computer interaction. Add a learning material and a relevant new task to this theme. Then delete all the new content you’ve added.
8	Send a message to your teacher using the message box.

2.4. Data Analysis

Each report was given a different name and then listed according to the heuristic and the cognitive walkthrough methods for the analysis of the data. Data obtained from each user and all the problems expressed were collected in one file regardless of their themes. Then, all the data was coded via an iterative cycle in order to categorize similar problems under one heading. At the end of this process, seven and six categories were obtained in accordance with the cognitive walkthrough and heuristic evaluations methods, respectively.

In the present study, the most common validity and reliability methods used in qualitative research, as suggested by Lincoln and Guba (1985), the variation method, peer discussion groups and participant content were used in

order to eliminate bias. According to Yin (1994), variation may be performed in various ways such as a variation of the data, the researchers, the methods and the theories. As the data was collected via the cognitive walkthrough and heuristic evaluation methods in the present study, a variation of method was used.

Problems and evaluations obtained via the participant content method, another validity method, were explained by consulting two of the users. The users stated that the problems and evaluations were similar to the ones they reported.

An expert in the field was constantly consulted during the coding of the data for the reliability of the study. Again, the categorization was conducted in consultation with an expert in the field.

3. Findings and Discussions

3.1. What are the problems determined by the cognitive walkthrough method on the developed environment?

According to the cognitive walkthrough method, the most problematic areas were determined to be in-site messaging, learning materials, overall usability, themes and tasks, access to the users and personal information, and the starting of a discussion and making a comment (Table 2).

Table 2: Problems determined via the cognitive walkthrough method.

Usability Problem	Frequency	Explanation
In-site messaging	69	Some of the problems encountered in in-site messaging; not being able to add other users to the address book, problems of sending messages, and of understanding the symbols and the titles.
Learning Materials	54	Some of the problems encountered in accessing the learning materials; no title for the learning materials, unclear download button and no information regarding the user adding the material.
Overall Usability	47	Some of the problems encountered in the overall use of the learning environment; lack of a search engine, unclear symbols and small font size.
Themes and Tasks	39	Some of the problems encountered in the themes and tasks; the names and locations of the themes, access to the tasks, and adding or deleting a theme and task.
User Information	36	Problems encountered regarding access to user information are as follows: no access to the user list and user information.
Starting a Discussion and Adding a Comment	32	Some of the problems encountered regarding starting a discussion and making a comment; juxtaposed buttons of “start a discussion” and “add comment”, insufficient space for comment, unclear symbols and unclear comments which start a discussion.
Personal Information	28	Some of the problems encountered in the section “Personal Information”; difficulty in adding picture and avatar, no refresh facility on the web site after a picture is added and uncontrolled updates.

Thirty users in the cognitive walkthrough group stated they encountered problems mostly while they were sending in-site messages to another user. The most important cause of this was that the users first had to add the person they would send a message to, to their address books. This feature was removed from the system in order to facilitate sending messages. Now the user list appears on the screen when a user wants to send a message and chooses the user/s s/he wants. Another problem in this area was that of unclear symbols. In order to overcome this problem, information regarding the function of the symbol was added which would appear when the pointer came to the symbols. Another important problem concerned the learning materials. As the learning materials were given in numbers on the site, the users accessed the chosen material by clicking on it many times. In order to overcome this problem, a menu was created for the themes and the relevant learning materials, and the titles of the materials were given in this menu. As the download symbol was unclear, a download button and title were added to the download link for all the materials on the site. The most common problem regarding the overall usability of the environment was the lack of a search engine. A search engine was developed and included in the system to resolve this problem.

Moreover, the font sizes were rearranged and the symbols were replaced with clearer ones. The problems encountered regarding the themes and tasks were overcome by replacing the themes with menus and by enabling the tasks to appear on the screen as soon as the page was opened. Links to “add themes and tasks” were rearranged so that they could be easily understood. Another problem encountered in the cognitive walkthrough group was access to the personal information of other users. In order to overcome this problem, the user list was rearranged in an alphabetical order, which could then be easily opened with one click, thus reducing the cognitive load of the system.

That the problems regarding starting a discussion and making a comment, which are the most important feature of the developed environment, were relatively less is a significant finding; because the learning environment gets more complicated when the audio-visual and textual comment features which had never been experienced by the users before, were used more often. However, there were still some problems (Table 2). In order to overcome these problems, the questions starting a discussion were rearranged so that the users could easily understand the mechanism, the commenting area was enhanced, the symbols indicating comment via audio-visual and text files were changed and included explanations regarding their meaning.

Most of the problems encountered in the section “Personal Information” were related to the written instructions, problems such as the difficulty in adding a picture and an avatar, the fact that the web site was not refreshed after a picture was added and the problem of uncontrolled updates. The necessary adjustments were made regarding the above-mentioned written instructions; e.g. using the instructions as “profile picture” instead of “an avatar”.

3.2. What are the problems determined by the heuristic evaluation method on the developed environment?

According to the heuristic evaluation method, problems were determined regarding the overall usability of the environment and its visual design, the themes and learning materials, in-site messaging, starting discussions and making comments, and access to personal and user information (Table 3).

Table 3: Problems encountered via the heuristic evaluation method.

Usability Problem	Frequency	Explanation
Overall Usability and Visual Design	59	Some of the problems encountered in the overall use of the learning environment; the book theme design of the learning environment, lack of a search engine, unclear symbols, inadequate “Help” section, insufficient instructions and notifications, and surfing problems.
Themes and Learning Materials	17	Some of the problems encountered regarding the themes and learning materials; the names and locations of the themes, no titles for the learning materials, unclear download button and insufficient instructions.
In-site Messaging	13	The most common problem encountered regarding in-site messaging was the difficulty in adding other users to the address book.
Starting Discussions and Making Comments	11	Some of the problems encountered in starting a discussion and making a comment; the juxtaposition of the “start a discussion” and “add comment” buttons, insufficient space for comment and insufficient file extensions.
Personal Information	8	Some of the problems encountered in the section “Personal Information”; uncontrolled password change and updates.
User Information	6	Problems regarding access to user information, namely no access to the user list and user information.

As the heuristic evaluation group was not set any task, most of the problems focused on the overall usability theme. Most of the problems reported by the cognitive walkthrough group were also observed in the heuristic evaluation group; e.g. the names and locations of the themes, not being able to add other users during in-site messaging, the juxtaposition of the start a discussion and add comment buttons, insufficient space for comment, unclear symbols, and unclear comments which start a discussion. The arrangements regarding these problems were explained above in the results of the cognitive walkthrough method. However, new arrangements were made for the problems that were different to those determined via the cognitive walkthrough methods; e.g. insufficient instructions and notifications, control of the password changes and updates and the book theme of the design.

Instructions and notifications were rearranged so that they could be easily understood, and necessary adjustments were made for changes on the profile page.

A book theme was used in the developed environment, which was considered to be attractive as it was different to existing learning media. A button to return to the main page was designed in the shape of a bookmark on the upper side of the environment. However, it was found that the users, via the heuristic evaluation method, did not like the book theme, and the visual design was rearranged on a plainer basis.

Conclusion

The present study was conducted as a case study, using a qualitative research method, in order to evaluate the usability of the Online Instructional Multi-Media Discussion Environment which was developed in the Department of Computer Education and Instructional Technology (CEIT) at the Hacettepe University as part of a doctoral thesis.

The study was conducted with 56 CEIT senior students. The participants were considered to be partly qualified since they had taken the Human-Computer Interaction lesson as part of their undergraduate curriculum, and they were randomly distributed into two groups in order to evaluate the usability of the environment using expert review methods. The first group with 30 participants evaluated the usability of the environment by performing eight set tasks via the cognitive walkthrough method. The second group of 26 participants evaluated the usability of the environment through a consideration of the heuristics of Nielsen via a heuristic evaluation method.

The individual reports of the participants were analyzed, the usability problems were determined, and solutions were suggested regarding these problems.

According to the data obtained from the 30 users using the cognitive walkthrough method, the most problematic area was found to be in-site messaging. Then the following categories were found to be problematic respectively: learning material, overall usability, themes and tasks, user information, starting discussions and making comments, and personal information. According to the data obtained from the heuristic evaluation group, the problems were examined under six categories. These were respectively, overall usability and visual design, themes and learning materials, in-site messaging, starting discussions and making comments and personal and user information.

Solutions suggested included the creation of a search engine through which the comments, users and learning materials of the environment could be searched, the dynamic listing of the users for the usage of the in-site messaging service, the changing of the learning environment “book” theme, the rearrangement of the names and locations of the learning materials, easy access to user profile information and the listing of the users, all of which were then applied to the learning environment.

The results of the research are considered to be significant as they may both help people responsible for the design of web sites and their content, and form the basis for further usability studies in order to develop online instructional multi-media discussion environments.

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