

Assessing Educational Web-site Usability using Heuristic Evaluation Rules

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Abstract

Usability evaluation is a very important procedure for the quality assessment of websites. In this paper usability evaluation methods are discussed. The application of one of these methods, the Heuristic evaluation, is further examined and the findings of its employment in the usability assessment of the new website of Hellenic Open University are described.

1. Introduction

Quality assessment and in particular usability evaluation is an important phase in the development of a website, which is often overlooked by modern web applications developers. Assessment becomes necessary nowadays as the web becomes gradually a platform of complex applications with increased interactivity and a front end of databases and corporate information systems. This new use of the medium increases the importance of the usability, as the web is used for accomplishment of complex tasks, like learning, retrieving information, interacting and collaborating with peers [Shum (1996)].

Today's highly interactive web applications tend to adopt interaction styles borrowed from traditional software. This is not however always acceptable, since the web poses special requirements that need to be taken into consideration [Bevan (1998)]. For instance, the characteristics of web users are not always well known in advance and can vary considerably. According to Nielsen [Nielsen (1993)], the highly quoted user-centered design methodology is considered applicable in this new context. The three principles of a user-centered design [Rubin (1994)] are presented as follows.

1. An early focus on users and tasks

This is not just simply identifying and categorizing users, but advocate direct contact between users and the design team throughout the development life cycle. On the other hand, caution should be taken on the fact that direct contact itself can be hazardous if it not structured. What is required is a systematic, structured, approach to the collection of information from and about the users.

2. Empirical measurement of system usage

In this case emphasis is placed on behavioral measurements of ease of learning and ease of use early in the design process, through the development and testing of prototypes with actual users.

3. Iterative design whereby a system is designed, modified, and tested repeatedly

Iterative design allows for the complete overhaul and rethinking of a design, through early testing of conceptual models and design ideas. It is a process of design, test, redesign and retest in order to bring the system to the desired state. This approach brings iterative usability evaluation at the centre of the design process.

In this paper we present the usability assessment of the new website of Hellenic Open University (www.eap.gr), which replaced the previous site that was in operation for six years. Two representative pages of the new website are shown in figure 1. The website offers useful information to the public and to the academic community and serving as a portal that leads to other useful sites and services of the university. The aforementioned usability assessment of the website, which was based on adapted methods proposed in the literature, was conducted by Software Quality Research Group of Hellenic Open University. The method used in the experiment was heuristic evaluation by usability experts.

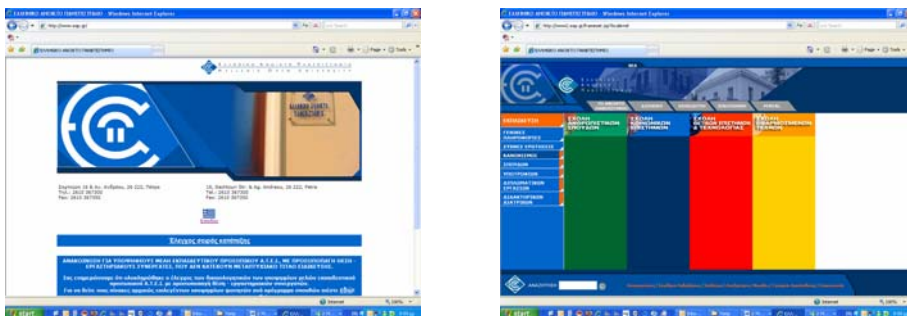


Figure 1. Web pages of HOU website

The following text is structured in four sections. In section 2 a summary of the most important and the most appropriate usability evaluation methods is presented. In section 3 an outline of the Heuristic evaluation method, which is the method used in the assessment, is presented together with the assessment procedure. In section 4 the actual assessment and its results are presented. Finally, the conclusions of the assessment are discussed in section 5.

2. Usability evaluation

The term usability is described in ISO 9241-11 [ISO (2003)] as “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”. The *effectiveness* is defined as the accuracy and completeness with which users achieve specified goals. The

efficiency measures the resources expended in relation to the accuracy and completeness with which users achieve goals. Finally *satisfaction* is the freedom from discomfort, and positive attitudes towards the use of the product. Nielsen [Nielsen (1993)] further described usability according to the five following basic parameters:

- Easiness and speed of learning of system use
- efficiency to use
- easiness to remember system use after certain period of time
- reduced numbers of user errors and easy recovery from them
- subjective satisfaction of users

Many attempts have been made to measure usability according to these dimensions and evaluate interactive software systems. Some of the most established usability evaluation methods, relevant to our context of applications are briefly discussed in this section. There are two main categories that these evaluation methods can be distinguished: *The Analytic* and the *Empirical* methods.

The *analytic methods* are based on theoretical models which simulate the behaviour of a user or on standards and rules. These methods often used in the laboratory at the phase of the syntax of specifications often before the development of the prototypes and without the participation of users. The *empirical methods* are based on the development and evaluation of the behaviour or the characteristics of a prototype or completed system. The empirical methods can be performed either in a laboratory or in the place that the system is in full operation. In the evaluation process the participant can be representative users as well as usability specialists [Avouris (2003); Crosby (1996); Lindgaard (1994)].

Attempting a different grouping of the methodologies used for the evaluation of usability, three basic categories of methods can be distinguished: *Inspection methods*, *Experimental methods* and *Inquiry methods*. These three categories include various methods that can be generally used in the evaluation of usability. In the case of the reported experiment, an outline of the methods that are suitable for the evaluation of a completed and fully operational system, like the website of HOU, is presented in the following paragraphs.

Usability **Inspection methods** are based on having evaluators inspect or examine usability-related aspects of a user interface. Usability inspectors can be usability specialists, but they can also be software development consultants with special expertise, end users with content or task knowledge, or other types of professionals. In most cases, usability inspection methods aimed at finding usability problems in an existing user interface design and make recommendations for fixing the problems thus improving the usability of the system [Nielsen & Mack (1994)]. In this particular case the most appropriate from the inspection methods are Heuristic Evaluation, Cognitive Walkthrough and Design Guidelines and Standards. *Heuristic evaluation* is

a method that is mainly based on rules of thumb and general skill, knowledge and experience of the evaluators. This method involves the judgment of usability specialists, on whether a user interface complies with established usability principles which called the Heuristics. Usability specialists judge either according to their own point of view or according to the observations of simple users of the interface. *Cognitive Walkthrough* is an inspection method that focuses on evaluating a user interface in terms of ease of learning. This method evaluates each step necessary to perform a task and in process reveals design errors that would interfere with learning by exploration. *Design Guidelines and Standards* are inspections where an interface is checked for conformance with a comprehensive list of usability guidelines and international standards. However this is a complicated procedure because of the amount of the guidelines and standards that exist and requires a high degree of expertise.

The **Experimental methods** involve the observation of individual users performing specific tasks with the system under evaluation. In this method the evaluators are appropriate end users that perform representative tasks, under the discrete attendance of usability experts. The observation takes place in a properly designed and organized usability laboratory [Rubin J. (1994)] that is essential for this method. Experimental methods include: *Performance measurement*, *Thinking Aloud Protocol* and *User logging*. In the *Performance measurement* the system performance is evaluated against pre-defined criteria, like time to complete a task or numbers of errors made. *Thinking Aloud Protocol* requires the evaluators to express loud their thoughts, feelings and opinions while interacting with the system. Finally *User logging* involves the record of the evaluator's activities with the use of special equipment like cameras specialized software e.t.c.

Finally, two of the most important **Inquiry methods** are the *User Interviews* and the *Questionnaires*. In these methods usability experts make direct questions to the users about the system. The answer to the questions can help the evaluators, which in this case are the usability experts, to draw conclusions about the parts of the system interface that pose difficulties to the users. On line questionnaires are particularly suitable to web applications [Feinberg & Johnson (1998)].

From all the above mentioned methods one, of the most suitable methods for usability evaluation of the website of HOU is the *Heuristic Evaluation* by usability experts. This method has been employed during the experiment discussed in the following section.

3. The Experiment

Heuristic Evaluation [Nielsen & Mack (1994)] is a method that is easy to use (can be taught in a half-day seminar), it is fast (about a day for most evaluations) and it is

relatively cheap. It can also be employed in systems that are completed and fully operational.

The process of the evaluation starts with a presentation of the interface that will be evaluated. In the process the evaluators work alone and they do not communicate with each other. The evaluation is separated in two phases. In the first phase the evaluator goes through the entire interface once to get the feel for the flow of the interaction and the general scope of the system. In the second phase the evaluator goes through the interface several times, inspects the various dialog elements and compares them with a list of recognised usability principles called “Heuristics”. These principles are not strictly defined and each Heuristic’s value is dependent on the case and the usability specialist working with it [Avouris (2003)]. A set of usability *Heuristics* derived from a factor analysis of 249 usability problems [Nielsen & Mack (1994)] is the following:

- Visibility of system status
- Match between system and the real world
- User control and freedom
- Consistency and standards
- Error prevention
- Recognition rather than recall
- Flexibility and efficiency of use
- Aesthetic and minimalist design
- Help users recognize, diagnose, and recover from errors
- Help and documentation

This set of usability *Heuristics* is considered as an integrated set and covers all the characteristics of HOU website that were under evaluation. Hence it was the set of *Heuristics* that we used in the usability evaluation we conducted. The results of the method can be recorded as written reports from each evaluator, in the case of usability experts, or can be derived by having evaluators verbalize their comments to an observer (usability expert) as they go through the interface. Typically the method lasts between one or two hours for each individual evaluator. If longer sessions needed it would be better to split up the evaluation into several smaller sessions each concentrating on a part of the interface. A recommended number of evaluators that should participate in a heuristic evaluation are five, but certainly at least three according to Nielsen [Nielsen & Mack (1994)]. In the presented case 5 evaluators were involved. Two of the evaluators were usability specialists and the other three were experienced in Heuristic evaluation.

4. Method of the study

During the study the evaluators were presented with the HOU website interface and they were encouraged to navigate through the application and carefully validate the implementation of each Heuristic rule. When a rule violation was detected, the evaluator identified where the violation occurred. At the end each evaluator filled a report describing his findings. In the following table (table 1), the number of detected errors for each Heuristic rule is presented.

Table 1. Number of errors found in each heuristic rule

Heuristic Rule	1	2	3	4	5	6	7	8	9	10
Number of detected errors	3	0	6	12	1	1	3	11	0	1

During the study thirty eight (38) usability flaws were revealed. Many of the usability problems were reported by more than one evaluator, confirming Nielsen's findings that four to five evaluators typically unveil 80 % of the overall usability problems. In the following paragraphs detected violations for each heuristic rule are presented and discussed.

1. Visibility of system status

The Evaluators found that in the left menu when a link is selected it is not highlighted as it happens with other hyperlinks throughout the website and this confuses the user because it can not see easily which hyperlink has selected. Another flow that was discovered and that makes the user confused is the fact that when the right menu has many choices it becomes long and you have to scroll down the page in order to see the rest of the menu choices. This is not so clear because the bottom frame is static and does not move.

2. Match between system and the real world

The terminology used in the website found very precise, clear and appropriate for typical users. Hence in this category there is not anything worth mention in terms of usability problem.

3. User control and freedom

In this case the evaluators found that there is a lack of navigational links in the web pages. For instance if a page is selected and because of the amount of information gets too long there is no link that can lead to back to the top. Also there are no links that can lead to the main page of the category. Another problem detected was that once you navigate from the introduction page of the site to its first page then you can not return to the introduction page by using the button "Back" of the Internet Explorer.

4. Consistency and standards

General guidelines and standards are followed across the site. Evaluators found some consistency problems though. The first pages of some categories are blank which

results in the confusion of the users. There is a variation of font sizes and fonts in some pages compared with the majority of the pages. Another confusing thing is the bottom menu. This menu is not obvious with the first sight. It should have been in button format instead so as to be consistent with the top menu and easily recognizable. Finally in the left menu in some cases there is not clear with the first sight which is the link and which is the header of a group of links that is not a link.

5. Error prevention

The website is carefully designed, therefore no errors detected from the evaluators except from one which was found in the search engine.

6. Recognition rather than recall

In general all options and possible actions are visible. In some cases though menus become too deep (6 levels deep), a factor that makes users confused because they have to remember where they must go in order to find something.

7. Flexibility and efficiency of use

In general the site does not pose flexibility and efficiency problems. The problem here focuses in the section called “Επικοινωνία”. In that section there is an alphabetic list of people that can be found. This makes the search of the user difficult. It would be better for the user if people were categorized in terms of their characteristics like the department they work. Also it would be very useful if someone could be found by typing his/her name in the search engine.

8. Aesthetic and minimalist design

Evaluators found that there are news and announcements in the introductory page of the site, which is not good practice in the design of a website, there is another link called “news” which not so obvious and finally a link for announcements. All these it would be better to be positioned in one place so as not to confuse the user. Despite the fact that the site is written in only one language (Greek) in the introductory page there is a Greek flag that is not necessary. Normally flags are employed in the first page of site so as to point out that there is a choice of language. In some cases you have to make two steps in order to access a webpage like “Portal” instead of navigate straight to the target. Finally in the section of education too much colour has been used. Furthermore the four coloured bars that represent the schools of the university are not so obvious that are links.

9. Help users recognize, diagnose, and recover from errors

In the case of HOU website there is not much need for error messages.

10. Help and documentation

For HOU website there is no need for the existence of Help and Documentation. The only thing that is missing and which would be very useful for the users is the existence of a site map.

5. Discussion-conclusions

In this paper different usability evaluation methods of web sites were presented. One particular evaluation method was discussed and used for the assessment of HOU website. This approach provided useful insight into the application and revealed various usability problems most of which were not previously detected.

Throughout this assessment, Heuristic evaluation was conducted by experts. This method is suitable for formative evaluation, as it can be used during design in prototypes of the application, but it can be used very effectively in a system that is already in use, like HOU website. The effectiveness of the method is depicted in the results of the assessment, where 38 usability flaws were detected. Furthermore, this method turns out to be time and cost effective.

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