Quality Evaluation of Educational Websites Using Heuristic and Laboratory Methods

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Abstract

Performing quality evaluation of a website, targets to draw certain conclusions, in order to determine if and in which degree the evaluated website features the required usability, measuring at the same time the users' subjective satisfaction. In this paper we examine the evaluation of the new version of the Hellenic Open University (HOU) website. Among a variety of alternative evaluation approaches, we chose to apply the methods of heuristic evaluation and performance measurement that have been used in generic-type software. The evaluation was performed at the Software Quality Laboratory of the Hellenic Open University, in collaboration with experts in assessing software quality and usability (members of the Software Quality Research Group) as well as regular users (students of the HOU), aiming to draw parallel conclusions and to compare the derived results. The combination of these two evaluation methods revealed users' non satisfaction and also usability problems that had not been traced in the website's developing phase. We indicate that, by correcting these detected deficiencies, the website can evolve to become effective, efficient, and handy, providing personal satisfaction to its users.

Keywords: heuristic evaluation, performance measurement, quality, usability, web site.

1. Introduction

The research is focused upon assessing the quality of the HOU's website (http://www.eap.gr) in regards to its usability and usage. We proceeded to the assessment starting by examining the compliance of the website with commonly accepted specifications and technical requirements based on websites that are considered as well designed. We also monitored the subjective satisfaction of users navigating in the assessed website.

In order to proceed to the evaluation we used usability techniques which could be divided into two categories: (a) the analytical assessing techniques that are based upon theoretical models and (b) the empirical assessing techniques that require the users' active participation.

The heuristic evaluation was selected among the first category of the analytical methods targeting to extensive "investigation" of the application's interaction features between user-software, based on objective and measurable criteria, in correlation with the required number of usability experts. From the second category we used performance measurement in the laboratory of the HOU. We recorded the responses as well as the users' views (students of the HOU Computer Science Course) and we proceeded with analyzing their behavior in the laboratory through observation and recording.

Members of the Software Quality Research Group, as well as collaborators of the Software Quality Laboratory, participated and contributed with their knowledge and experience in the realization of this research. The results of the research consist of: (a) the specialists' observations concerning the site's evaluation and (b) the users' response during their navigation within the website. The farthest target of this project was to improve the interaction and communication between the website's visitors (academics, students, public) and the HOU.

By applying the heuristic evaluation thirty-eight (38) usability faults were revealed in the website that had not been detected in the designing phase. For example, in eight out of ten Nielsen's usability rules [Nielsen et.al (1994)] faults were detected. The majority of the problems were detected by at least two evaluators. The experimental method in the HOU's laboratory confirmed the usability problems that were indicated by the heuristic evaluation. Thus, we concluded that the website is not effective neither efficient nor handy. Finally, we suggested ways of improving the detected faults in order to advance the quality of the website's services.

2. Assessing the HOU's website

In this project [Papadopoulos et.al (2007)] we present the quality evaluation of the usability and usage of the HOU's new website that replaced the previous one which had a lifespan of six years. In picture 1, we illustrate two representative pages of the new site. It offers useful information to the public and the academic community. It is used as a gateway that leads to useful departments and services of the university. The evaluation of educational websites requires particular assessment criteria that can certify the usability and usage of the website. Based upon the bibliography, the assessment criteria for evaluating these educational refer to two basic parameters:

- **Content** (targeted audience, reliability, authenticity, objectivity, wholeness, updated status)
- **Technical Completeness** (aesthetics, navigation, access, usability)

According to Rubin [Rubin J. (1994)] the user-centric software is governed by three principles:

1) Early focus upon the users and the tasks.
2) Empirical measurement during the function of the application.
3) Repetitive designing upon which an application is continuously designed, modified and examined.
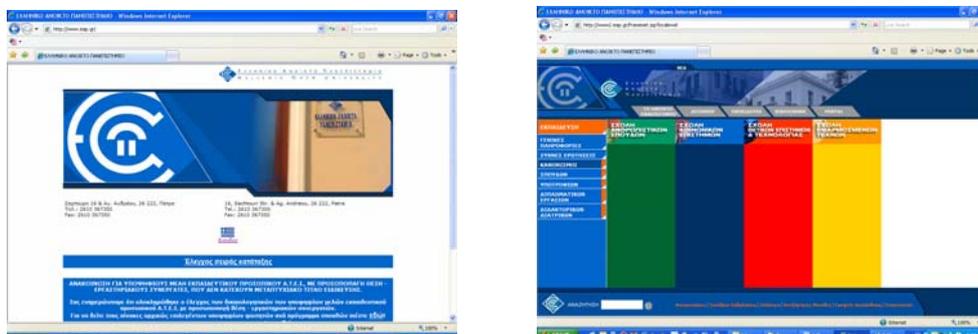
Picture 1. Web pages of HOU website

3. Heuristic Evaluation in the website

The **heuristic evaluation** [Nielsen et.al (1994)] is an easy to use, fast and relatively inexpensive method. It applies to software that has been completed and has already been put in operational phase. By using the heuristic evaluation to estimate the interaction quality, we can initially trace possible problems that the users might face during their interaction with the website.

3.1 The data of the heuristic evaluation

During the heuristic evaluation the evaluators were encouraged to navigate in the website of the HOU and check if the selected heuristic rules were applied. When one of them detected an error in the application of the rules he would determine the exact default spot. At the end of the assessment, each evaluator gathered all these instances of error as well as his conclusions in a single report. In the following board we can see the number of the detected errors for each heuristic rule [Kostaras et.al (2007)].

Table 1. Number of errors that were detected for each heuristic rule

Heuristic Rule	1st	2^{cd}	3rd	4th	5th	6th	7th	8th	9th	10th
Number of Detected Errors	3	0	6	12	1	1	3	11	0	1

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During the evaluation thirty-eight usability problems were revealed. Many of these problems were detected by more than one evaluator. This ascertainment is in line with Nielsen's conclusion that four or five assessors are able to cover the 80% of usability problems. All the violations for every different heuristic rule are presented and discussed in section 5 of this paper.

4. Usability Evaluation in the Software Quality Laboratory

For the presented experiment we applied the method of performance measurement, which resolved in the following outcomes.

4.1 Presentation of the results of the usage scenarios

Script 1: In the 1st question which was *"Find the director of the Department of Education"*, six students managed to find the information in the webpage while two of them failed. In the 2nd question, *"Find the person who is in charge of sending teaching material to the postgraduate course of Orthodox Theology Studies"*, three students managed to find the information, three others failed, while two of them though they were navigated to the correct page they failed to see the information. In the 3rd question, *"Find the person who is in charge of the postgraduate course of Business Administration (MBA)"*, six students found the information while two of them failed to do so. In the 4th question, *"Find the person who is in charge in the registration office of the postgraduate course of Quality Assurance"*, six students found the information and two of them failed.

Script 2: In the 1st question, *"Find if the degrees of the HOU equal in value with those of the Public Universities"*, seven students managed to find the information and one failed. In the 2nd question, *"Is there a possibility of a PhD in the HOU?"*, six students found the information while two failed.

Script 3: In the 1st question, *"Find information about the program Diodos"*, six of the students found the information and two of them failed. In the 2nd question, *"Find information about the scholarships that the HOU offers"*, all of the students succeeded in finding the information.

4.2 Interviews' outcomes concerning the usability evaluation

According to the method of performance measurement, each student after the completion of the three scripts had to go through a short interview. Afterwards they were given the opportunity to express their opinion about the website and about the three scripts by completing a short questionnaire. We rated the answers from 1 to 4, so we could use the sum as it is or transform it in Likert climax for a more advanced quality evaluation. The same procedure was applied for all the questions.

In the question, *"How easy did you surf inside the site?"*, one student answered *"easily"*; three students answered *"relatively easy"*; two students answered *"average"* and finally two of them *"not easy at all"*.

In the question, *"In general terms, how easy did you find the information that the scripts were asking from you?"*, two students answered *"easy"*; two others answered *"relatively easy"*; two students found them *"difficult"* and other two of them found them *"very difficult"*.

In the question, *"What is generally your impression of the site's aesthetics?"*, one student answered *"really good"*; three students answered *"good"*; two of them answered *"not really good"*; and a couple of them agreed on *"not good at all"*.

In the following question, *"What was it that you did not like in the site?"*, the students noted that the site was *"very static"*, they stressed that the search field should have been *"in a more obvious spot"*. They did not approve of the *"announcements in the front page"* neither the *"combination of the colours"*. They experienced difficulty in *"detecting information"*. They did not like *"the site's structure generally"* and *"the educational section in particular"*.

Finally in the question, *"Did you see the Search field?"*, the following answers came up: Two students answered positively, three of them negatively and three more, that it took them some time.

All the weaknesses and violations of the rules that have been detected are presented and discussed in the analysis that follows.

5. Result Analysis – Conclusions

5.1 Assessment of the heuristic evaluation

With the heuristic evaluation we aim at locating problems that spring out of Nielsen's ten rules of usability. The objective of heuristic evaluation is not suggesting solutions for the spotted issues, the main scope is actually in tracing them. In heuristic evaluation [Nielsen et.al (1994)] the assessors, bearing in mind standard usability rules (style, guides, usability guides), control the under examination application's interface, in order to trace any elements not being in accordance with the specific rules.

All the violations that have been detected for each heuristic rule are presented and discussed in the following paragraphs [Kostaras et.al (2007)].

1) Visibility of system status: The assessors found out that the hyperlinks on the left-hand menu are not stressed when chosen (e.g by changing colour) as it usually happens with other hyperlinks in the website. As a result, the user gets confused

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because he cannot tell which hyper-link has been chosen. Another flaw that might disorientate the user is the existence of options in the left menu that are not directly visible. Apart from that, there are many choices on the left-hand menu that cannot be spotted easily. Due to this fact, the scroll bar of the web page should be moved by the user, however this is not clear as the below frame is static.

2) Correspondence between the system and the real world: The website's terminology is characterized as highly precise, clear and appropriate for common users. Therefore there will be no further comment made upon that.

3) Freedom and control by the user: In this case the assessors found out that there is no possibility of surfing between the links of the same webpage. To give an example, let us choose a page where there is quite an amount of information that does not appear all at once. When we find ourselves at the end of the page we realize that there is no link to lead us directly to the top of it. There is neither any link to lead us back to the homepage of a certain section. Imagine a student surfing within the pages of a Faculty of the Institution and then he cannot go back to the homepage of the Faculty because there is no link. Another problem is that when a user enters the site from the link "http://www.eap.gr" and surfs to the first page of it, he cannot go back by clicking "back" on the Internet Explorer.

4) Consistency and models: The website follows general instructions and models. However, the assessors faced some consistency problems. The front pages of some categories were blank. They also observed a deviation in the fond sizes and the fonts of the lines in some pages in comparison to the majority of them. Moreover, the menu at the lower part of the page is not quite clear at first glance. The buttons down there should have the same shape as the buttons of the menu at the top of the page in order to be distinct. Finally at the left-hand menu there are instances where we cannot tell at first glance the link from the sign about a group of links which actually does not lead us anywhere.

5) Error prevention: The website was designed carefully. So, there are no errors detected apart from one that was spotted on the search engine.

6) Admission instead of recall: Generally all the links and the actions are visible. In many cases the menu gets very profound (6 stages of depth). This might cause confusion since the user should constantly keep in mind which direction to take in order to find the information that he is looking for.

7) Adjustment and efficiency: Generally the website does not cause problems of flexibility or efficiency. The main problem is restricted in the *Contact* section. There is not even a name catalogue in the section. This makes the search even more difficult. It would be a good idea if people were grouped according to their working

post in the department they belong to. Moreover it would be even easier if we could just place their name in the searching machine.

8) Tasteful and minimalist design: The assessors found out that there is news and announcements in the introductory page. Judging by the fact that additionally to that, there is a link called *"News"* – though not quite clear – and a link called *"Announcements"*; this is not considered to be a successful design. All the news and announcements should be placed in the same section in order to avoid confusion. In some cases we have to overtake a page like a portal, step by step instead of surfing directly to the target. In the education section, too much colour has been used, the four coloured bars of the faculties' web pages are not quite distinct as separate links and finally there are four different menus in the page.
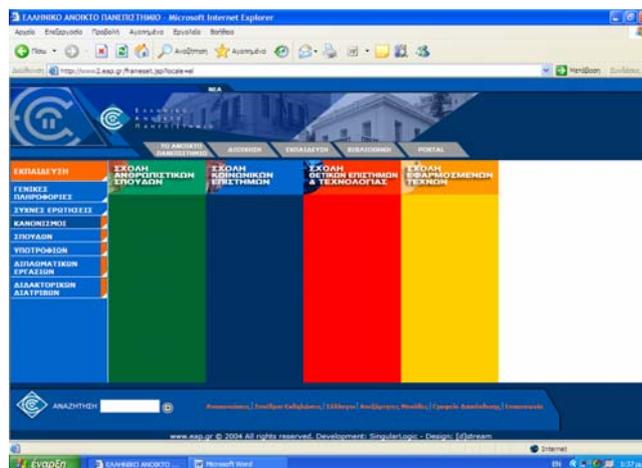
Picture 2. The web page of Education.

9) Admission and reformation: No major errors were detected.

10) Assistance and documentation: There is no need for assistance and documentation. The existence though of a guiding map within the site could be of use to the visitors.

5.2 Assessment of Performance Measurement

a) Assessment recording of usability lab

Careful study of the subjects' behavior during the experiments that were held in the assessors' lab according to the method of performance measurement revealed some problems within the HOU's website.

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***Script 1*:** Target of this script was the evaluation of the site's usability and the level of the information that is offered to the users – students of the HOU.

Through observation of the subjects' attitude and study of the recorded material we conclude that the majority of the participants found it hard to surf in the website. This is made more obvious by their performance in the first two questions. In those two questions the subjects experienced problems of orientation. It also took them longer to answer than it did for questions 3 and 4. Finally they clicked on more web pages in order to find the information they were looking for.

Limited feedback was also observed. While the users were scrolling in order to thoroughly read a page, they were getting lost since they could not recall which hyperlink they had chosen. Apart from the above, the link that would direct the users to the top of the page was missing as well.

The subjects-users had no link available to lead them back to the main homepage of faculty's or node. They were clicking "back" or "front" on the Internet Explorer. The colour change was not very clear neither for the hyperlinks nor for links that had been previously opened.

The left-hand menu confused the users-subjects since the links were not quite easy to read. The density of the information and its shape (line, colour, background) did not make things easier either. Another source of confusion was the fact that many links in the left-hand menu were not visible without scrolling. Finally the menu at the bottom of the page was not well-defined.
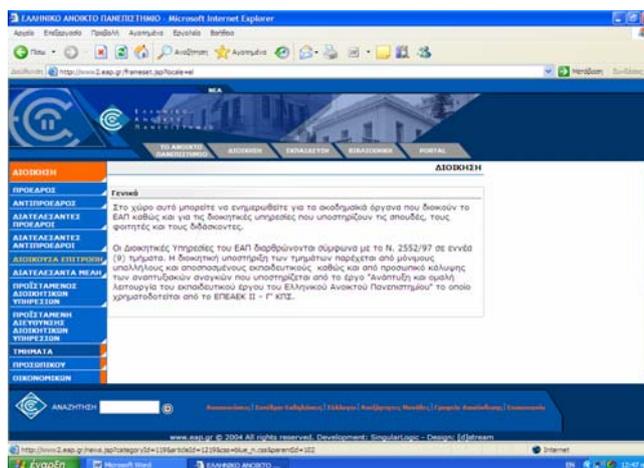
Picture 3. The web page of Administration

In the 3rd question the subjects-students started using the search field but only one of them found the correct answer. The search field was of no use for the other two. One of them did not answer at all and the other one was remarkably late.

In the 2nd question *"Find the person who is in charge of sending educational material to the postgraduate course of Orthodox Theology Studies"* we observed that the subjects were unable to spot the information they were looking for within a group of information with similar characteristics and density (e.g hyperlink of Educational Material). The results showed that the page does not provide the precise information that will raise the user's confidence. Two of the students did not manage to give a correct answer, one of them failed, while only two answered correctly.

*Script 2***:** Here we tried to evaluate the usability and the level of the given information. This part concerns postgraduate candidates as well as "web-surfers" that are looking for information about the HOU'S courses.
Seven out of eight subjects found the right answer. They experienced less difficulty compared to script 1. The information is scattered. The answer to the specific question could be found in three different sections; in the "*FAQ*s"; the "*Legal Framework and Mission*"; the *"Innovations"*.

The fact that no subject used the search field makes us think that:
   1) The search field is placed in a not distinct place.
   2) The question was quite easy and the subjects could answer after having surfed in the net.
   3) The site's usability is quite satisfactory.

The third conclusion comes in contrast to the conclusion we reached at the end of the first script where the site's usability was questioned. In the second question six out of eight subjects gave relatively quick answers. We conclude then that the information is placed on the right spot.

The subjects experienced the same difficulties as these were described in the first script.
   1) During the surfing there were no links to lead back to the homepage.
   2) The colour change in the hyperlinks was not clear.
   3) The opened links were not indicated by a different colour.
   4) The links on the left-hand menu were not quite readable.

It has been suggested that the above characteristics influenced the subjects negatively. However, the more time they spent though in the site, the better their orientation was becoming. The "environment" was becoming friendlier by degrees.

*Script 3***:** This part evaluates the services and the students' ability to be informed.
For two questions four of the subjects used the search field. The subjects that did not use it did not give an answer. Our conclusions are:

1) The search field is effective and helpful.
2) The familiarity of the users with the site helps them distinguish the links quicker. However, this does not affect the usability or the interaction between the users and the site.

In the first question of the script one of the subjects was surfing outside the HOU's website. It had moved on to the *Career Services Office* and the *Library*. This fact confirms the implication that the design of the specific site is not quite successful. The subjects experienced the same difficulties that are mentioned in the previous scripts.

b) Assessment of users' interviews

By studying the users' answers to the first question, *"How easy did you surf inside the site?"*, we notice that half of the users found the site difficult to use.

In the second question, "*In general terms, how easy did you find the information that the scripts were asking from you?*", half of the subjects admitted that it was hard to find the information in question. The surfing problems, the poor usability and the designing errors in combination with the low "visibility" of the site, made the users' search even more difficult.

In the third question, "*What is generally your impression of the site's aesthetics?*", half of the subjects had a negative impression. Their answers to the previous two questions as well as the observations from the performance measurement agree with the conclusions of the heuristic evaluation. That pays justice to the users' opinion.

In the fourth question, *"What was it that you did not like in the site?"*, there's a variety of responses. The students'-subjects' responses to this answer pays justice to our conclusions that followed the heuristic evaluation as well as the performance measurement.

In the fifth question, *"Did you see the Search field?"*, we realize that three students did not pay attention to the field at all. Two students saw the field about an hour later; and finally only two of them saw the field on time. The search field was the only error that occurred in violation to the rule *Error prevention*. The outcomes of the performance measurement verify the fact that it is a very important designing error.

c) Total assessment of Performance Measurement

1) Though simple and understandable, not all the texts of the site were readable.
2) The surfing is not considered to be easy but does not require particular skills either.
3) There is no map site or any other kind of help for the users' orientation.

4) There are no options of transitions among the pages. It is done only through the Browsers buttons.
5) The text, the colours, the graphics are not considered to be attractive enough. They do not attract the user's interest.
6) There is not great interaction between the user and the site. The only instance of interaction is just a click!
7) The structure is not satisfactory; in particular the section of Education.
8) At any time the appropriate information must reassure the users about the success of their choices.
9) The position of the search field is another problematic issue. The problem was highlighted by the students who participated in the experiment.
10) There are no multimedia (sound, image, video, etc) in the site.
11) The hyperlinks do not open in a page of different color.

7. Discussion – Suggestions for Improvement

The website of the HOU is a very considerable effort that aims to a healthy interaction between the Institute and the Hellenic society; the members of the academic community; and the administrative personnel.

The recording and the analysis of the above conclusions was initiated by the HOU which is the only vehicle of Open and Distance Education in the Hellenic third degree education.

Here are some suggestions for improvement and expansion in the website:
1) There could be a site map that could help the users with their surfing and their searching for information and their inquiries.
2) The search field could be placed up and on the left side of the page so that the users can observe it easier.
3) As this is of great importance to the students (current or future ones), this section could be improved for their easiest access.
4) The really useful information should be carefully structured and accessible since the users usually scan a site.
5) The offer of the information should be done according to the well known usability rules. For example one idea should be developed within a paragraph; and since most readers pay attention only to the first line, this line should summarize the whole meaning. Apart from that, the text should be short and clear, not long and meaningless.
6) The aesthetics should be improved because it influences strongly its reliability. Also, its links for farther information could be bettered.

8. Further discussion and conclusions

The educational website of the HOU is the site that informs about courses, the administration of the Institute; about events and conferences, etc. It applies exclusively to an audience that has to do with the third degree education; students; members of Professors etc; administrative personnel, etc.

The site's usability is one of its advantages. The user can interact with the system and has easy access to its content. Its effectiveness, its efficiency and the personal satisfaction it offers make the site subject to the ISO 9241 international model. The heuristic evaluation is based upon Nielsen's heuristic rules. It summarizes the designing principles which "inspect" the user's interface according to objective and countable criteria.

The heuristic evaluation secured awareness during the application and revealed various usability problems that had been not detected before.

The evaluation was held by specialized experts. This method can be used for formative evaluation since it can be applied on an application that is already in use. The effectiveness is usually illustrated on the results and the heuristic evaluation revealed 38 usability problems. Apart from that, the above method is advantageous as it concerns time and cost.

Using a methodology is based upon evaluation made by experts (like the heuristic evaluation), correlatively with a typical evaluation (observations or tests in usability laboratory) appears to generate important conclusions and constitutes an effective approach for Universities' websites.

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