

The Influence of Aesthetics and Content Structuring to E-Learning Systems' Users Behavior

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Abstract

This paper presents a case study, in which a representative sample of users evaluated two different implementations of an e-learning system, developed particularly for the purposes of this survey. The users' evaluation focuses on three specific factors which were the content structure, the navigation and the aesthetics of the system. The main aim of this paper is to determine the influence of these factors to e-learning systems' users behavior by gathering and analyzing the opinions of the users who participated in this case study.

1. Introduction

Since 1874, when the University of the State of Illinois was founded offering correspondence studies, up to date, a number of technological means have aided distance education. Web technologies are not just the latest innovation but a large step forward whose promise will take a long time to be fulfilled in educationally non-trivial ways. This has happened before, when technologies passed by before they could be successfully utilized in education –at least formal education. During the past ten years the educational community has witnessed a real revolution regarding the means with which education can delivered. High speed networks, powerful hardware available to simple users, multimedia-enhanced material, and free access to informal learning resources are just some of the trends introduced by the latest advances of technology. The vision of adaptive e-learning systems that could leverage the learning process throughout an organization seems, theoretically and technologically feasible [Pittinsky (2002)].

Despite the advances in technology, performance in terms of pedagogy and actual learning gains are not as significant as expected. Current teaching and learning practices are based on the information transfer paradigm: information is passed from the teacher to the student. This model enforces the student to consume information without being able to build knowledge [Anderson & Whitelock (2004)]. This static model of learning is supported by most state-of-the-art e-learning tools in the market. Information transfer is popular because it is easily supported by Web technologies but its educational effectiveness is seriously questioned even in organizations than depend upon ODL (Open and Distance Learning) for their daily operation [Xenos et

Al. (2002)]. Current e-learning tools offer many impressive functions but they tend to be complex for novice users and are often costly to support. The question of whether technological advances alone are adequate for an effective learning experience is strong among end-users of e-learning systems. A possible solution for boosting e-learning systems' performance includes **quality assessment of services** during their design and after their deployment. Assuring service quality is obviously a key concern in many aspects of learning, education and training, so why should it be especially crucial in relation to e-learning? In large scale e-learning applications, such as Virtual Campuses, there are many stakeholders with different goals, requirements and especially different definitions of quality. This greatly impacts the design process and shapes the final outcome. Because of these challenges, formal methods are needed for evaluating and assuring quality of service in such systems. E-learning system quality is different, although connected, to e-learning curricula quality. The first is purely technical while the latter is connected to pedagogy. They both strive to ensure academic integrity.

Quality assessment can take place during the design of the software and during its operation. In this work, we developed from scratch a simple e-learning system in two different implementations. Although e-learning development platforms existed, the development started from scratch allowing the developing team to control all the parameters of the e-learning system. The main goal of this approach is to allow us to study in both implementations how aesthetics and content structuring of each developed e-learning systems affected the users' behavior. The following text is structured in four sections. Firstly, a brief description of the development of the e-learning system and its content is presented in the second chapter. The third chapter describes the sample of users that participated in this case study and the evaluation methods that was used. In the fourth chapter the gathered results of the case study and a brief analysis of the outcome are presented. Finally, in the last chapter we conclude by spelling out the key points of the paper.

2. The development of the e-learning system

The presented work was conducted by Software Quality Research Group [SQRG (2007)] of the Hellenic Open University [HOU (2007)]. The Hellenic Open University started to offer bachelor courses in the year 2000, based on the distance-learning model. Initially, many of the learning procedures were influenced by the British Open University [UK (2007)] model. This model initially was a traditional distance model with limited or no use at all of e-learning facilities. In the HOU students studied their material –mainly printed textbooks– from distance. In addition, they had the option to attend a small number of face-to-face counselling meetings. Currently, the HOU provides six bachelor degree courses and 24 postgraduate courses, most of them using e-learning services. For the purposes of the presented case study the SQRG developed a simple e-learning system. A number of sections

presenting specific learning material were created, utilizing common lessons of basic topics about informatics and computer usage. In detail, the e-learning material that was designed and imported to the system referred to the usage of MS Office (Word and Excel). Specifically, it was preferred to describe these applications, their interface and their available functions, because it was much more convenient to find a representative sample of end-users to participate in this case study.

2.1 Selection of learning material

The basic aim of the implementation of this e-learning system was not to create a thorough and detailed online user manual of the two applications of MS Office. On the contrary, the development team focused mainly on the creation of a simple system by which the end-user is able to learn in a fast way the basic functions and the most common practices of these applications. Besides, the object of this case study was to examine and measure the influence of aesthetics and content structuring to e-learning systems' users behavior. The subjects of the selected learning material aimed at the familiarity of the users with the interface of the applications and at the ability to search, exploit and use their functions easily and correctly. Comprehensive examples are provided in which specific directions of using are described step by step. Furthermore, typical screenshots are attached presenting forms, tools, buttons, menus etc. of the applications to improve the understandability of the material. The learning material was divided and framed into 12 basic categories, 6 categories of MS Word and 6 categories of MS Excel. Each basic category consisted of 5 to 20 sub-categories, depending on the field of the category. Finally, each sub-category was presenting a single and particular topic of the material. As a result, the whole material was structured in a complete hierarchical mode and the users had to follow a top down walkthrough in order to access a specific learning object of the system.

2.2 Implementation of two different versions

In this case study we focused on three particular factors of an e-learning system. These factors were the content structure, the navigation and the aesthetics of the system. Our aim was not to implement an optimum or a high quality e-learning system to present the capabilities and most common functions of the two applications of MS Office. On the contrary, two different but equivalent versions of the same system were developed, with specific and obvious alterations according to the three factors mentioned above. Moreover, according to our opinion we firstly decided about a number of negative and positive matters related to these factors. Then we divided on purpose both these negative and positive matters equivalently to the two different versions while we were designing them. As a result, no version was better than the other as far as all of the three factors were concerned. It must also be mentioned that the learning material and its hierarchical structure was completely the same in both versions of the e-learning system.

The first version (ver.A) of the system was consisted of simple html pages for each category and each sub-category of the learning material. As a result, each specific topic of the material was presented in a separate page, Simple html links and navigation buttons were inserted in these pages. The structuring and the navigation through these pages were achieved by a hierarchical and a sequential way. In other words, while viewing a page, a user may only move a step forward or backward in the same level of hierarchy or a level up or down. Finally, a different colouring of the background of the pages was selected according to the application they referred to. Specifically, a light blue background was chosen for the MS Word pages, whereas all the MS Excel pages had light green background. As a result, it was obvious by a simple glance in which application every page was referring to. In Figure 1 typical screenshots of this first version are presented.

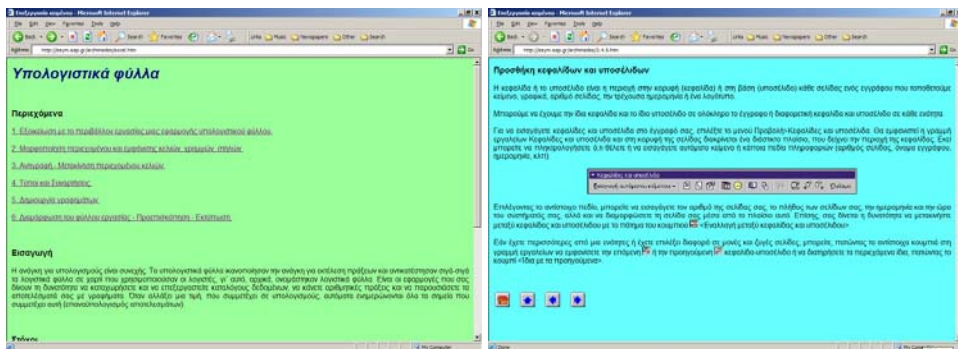


Figure 1. Typical screenshots of the first version of the e-learning system

The second version (ver.B) of the system was designed by means of frames. In detail, three different frames were created: a top frame which was the header of the system, a left frame which was the menu with the table of contents and a main frame for the html pages with the learning material. In this version html pages were developed only for the main categories of the material, in which the content of all of their sub-categories was imported. As a result, this version consisted of fewer but significantly larger and of more content pages than the first one. A user was able to navigate through these pages not only by a number of simple links placed inside the pages, but also by the menu frame, in which links to the pages of the main categories of the selected application could be found. As a result, in this version a user was able to determine in which application every page was referring to simply by observing the contents of the left frame. In order to access the learning material of a sub-category, a user had to either scroll down the page of the appropriate page of the main category or click to the appropriate link which was placed on the top of that page. According to the factor of colouring, in this version all the pages of both applications had a white background. However, the top frame and the menu frame had blue background and white coloured fonts, so as to be easily distinguished from the main frame where the

learning material was presented. In Figure 2 typical screenshots of this second version are presented.

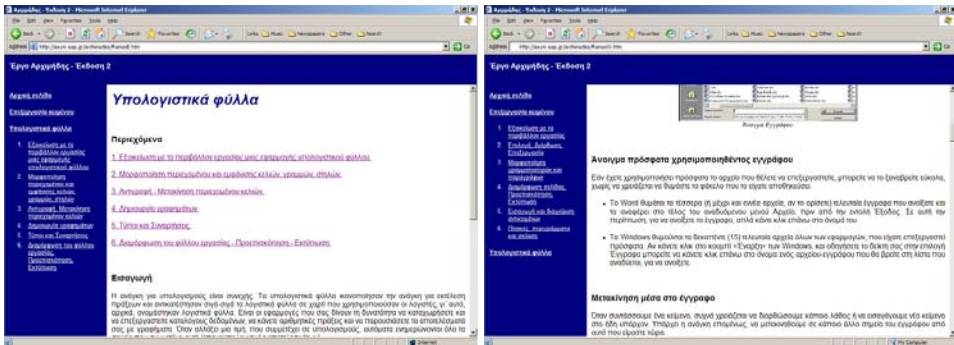


Figure 2. Typical screenshots of the second version of the e-learning system

3. Setting up the case study

3.1 Selection of the evaluators

After constructed the two versions of the e-learning system, in order to conduct the survey, we had to select a representative sample of end-users to evaluate the system. As a result, we preferred to choose users having different levels of experience in MS Office applications and e-learning systems in general. In this survey evaluation responds were gathered from 32 users. The different levels of experience of these users can be distinguished to the following:

- Low level. Users with low or medium semantic and syntactic knowledge.
- Medium level. Users with either low semantic and good syntactic knowledge or good semantic and low syntactic knowledge.
- High level. Users with both high semantic and syntactic knowledge.

In detail, the sample of users consisted of 12 low level, 14 medium level and 6 high level users. The users participated in this survey were a) students of a technological educational institute, b) simple computer users without any programming experience and c) programmers and computer engineers. In this survey the users were not requested to follow a specific scenario of usage of the developed e-learning system. On the contrary we just asked them to create a new document in MS Word and a new worksheet in MS Excel and then start practicing while utilizing a number of functions of these two applications that were presented in the e-learning system. After this evaluation they expressed their opinion of both the two versions of the system, focusing only on the three factors that this survey was concerned about. Finally, they were asked about their opinion and guidelines about a new improved version of the same e-learning system.

3.2 Evaluation and analysis methods

In order to evaluate the two versions of the developed system we used experimental and inquiry methods. Specifically, we selected the following three methods to collect users' opinions [Stavrinoudis et Al. (2005)]:

- **User questionnaires.** Users are requested to express their opinion of the quality of a software product by completing a structured questionnaire.
- **User interviews.** The researcher is in direct contact with the user. The questions of the interview follow a hierarchical structure, through which the general opinion of the product is formed.
- **User actions logging.** The most common techniques to record the actions of users are the notes of the researcher, the voice recording of the users, the video recording of the users, computer logging and user logging.

In this case study we used all of these methods for all the users, in order to estimate their opinion in a more integrated way.

In order to analyze statistically the derived data from the survey, an appropriate statistical method was followed. This analysis focuses mainly on questionnaire-based surveys. However, it can be easily generalized, so that it can be applied to any of the aforementioned evaluation methods. In order to measure the average users' opinion of the e-learning system, the QWCO (Qualifications Weighed Customer Opinion) technique, which is measured using the formula shown in equation (1), was selected.

$$QWCO = \frac{\sum_{i=1}^n (O_i \cdot E_i)}{\sum_{i=1}^n E_i} \quad (1)$$

The aim of this techniques is to weigh users' opinions according to their qualifications. In order to achieve this, 'O_i' measures the normalized score of user 'i' opinion, 'E_i' measures the qualifications of user 'i', while 'n' is the number of users who participated in the survey.

The questionnaire consisted of 9 multiple choice and 1 open question. The first three of the multiple choice questions (Q1, Q2, Q3) were related to the content structure, the next three (Q4, Q5, Q6) were related to the navigation and the latter three (Q7, Q8, Q9) were related to the aesthetics of the system. By the last open question the users were able to report their opinion of the e-learning system in general. For the questions Q1, Q2, Q4, Q5, Q7 and Q8 the Likert scale was used with five multiple choices, which were marks from 1 to 5. The higher the mark given by the user to one of these questions, the higher was his/her opinion about the factor related to this specific question. Finally, by the questions Q3, Q6 and Q9 the users were asked which version they preferred according to each factor.

4. The results

Table 1. Results of the questions Q1, Q2, Q4, Q5, Q7 and Q8

Question	Low level average	Medium level average	High level average	Total average	QWCO
Q1-ver.A	4,17	4,21	4,33	4,22	4,23
Q1-ver.B	2,25	2,50	3,67	2,63	2,74
Q2-ver.A	3,83	3,93	4,33	3,97	4,01
Q2-ver.B	1,83	2,14	3,33	2,25	2,38
Q4-ver.A	3,00	2,36	2,00	2,53	2,43
Q4-ver.B	3,75	3,93	3,33	3,75	3,72
Q5-ver.A	2,75	2,71	1,67	2,53	2,44
Q5-ver.B	3,33	3,07	3,00	3,16	3,12
Q7-ver.A	3,75	3,07	3,00	3,31	3,23
Q7-ver.B	2,08	2,50	2,50	2,34	2,39
Q8-ver.A	3,00	2,86	2,00	2,75	2,67
Q8-ver.B	3,33	3,29	3,33	3,31	3,31

The results of the questions where the Likert scale was used are presented in table 1. Each row refers to the results of each question and of each of the two versions of the system. In the last column the results of the QWCO formula is shown. Table 2 presents the percentage of the four different choices of the remaining three questions. As far as the content structure is concerned, it is obvious that the first version had better results than the second one. Users, especially non experienced ones, prefer the learning material to be structured in more pages which have less and more concise content. It was also observed that users found more difficulties in understanding and utilizing the material of the larger pages of the second version. Regarding the navigation factor, users preferred the capabilities and functions implemented in the second version. Furthermore, the experienced users judged both versions much more strictly than the others, probably because of their higher requirements concerning this specific factor. However, 50% of the users preferred a new version that could combine the navigation functions of both of the implemented versions. Finally, regarding the factor of aesthetics, users preferred the first version as far as the understandability and the usability of the learning material is concerned. On the contrary, they preferred the second version as far as the functionality of the system is concerned. Besides, most of the users found preferable a new version that could combine the aesthetics matters of both of the implemented versions.

The outcome of both the open question of the questionnaire and the interviews revealed that non experienced users give greater weight on issues such as the easiness

to understand the learning material. They prefer simple e-learning systems, whereas experienced users prefer more advanced systems that provide more functions to them.

Table 2. Results of the questions Q3, Q6 and Q9

Choices / Questions	Q3	Q6	Q9
Version A	65,63%	9,38%	37,50%
Version B	12,50%	31,25%	15,63%
Combination of 2 versions	12,50%	50,00%	43,75%
None	9,38%	9,38%	3,13%

5. Conclusion

From the analysis of the above mentioned results it concludes that an improved version of the developed system should be structured by pages with limited and understandable learning material. Alternative navigation functions must be provided. Finally, while deciding for the systems' aesthetics we must have in mind to improve both the understandability and the functionality of the system. In order to construct an e-learning system of high quality, the developer should take into account the preferences of both the experienced and non experienced users. After all, over time the experience of the users increases and they should be considered as experienced ones [Stavrinoudis et Al. (2005)]. Decisions about personalization and adaptation of the system by the end-users may also be provided. After all, while constructing such a system, developers must always give greater weight to the issue of learning.

References

- Anderson, T., Whitelock, D. (Eds) (2007), *The Educational Semantic Web: Visioning and Practicing the Future of Education*, Journal of Interactive Media in Education, Special Issue on the Educational Semantics. Available online at: <http://www.jime.open.ac.uk/2004/1>
- Hellenic Open University. (2007), Web site: <http://www.eap.gr/>
- Pittinsky, M.S. (2002). *The Wired Tower: Perspectives on the Impact of the Internet on Higher Education*. Financial Times/Prentice Hall.
- UK Open University. (2007), Web site: <http://www.open.ac.uk/>
- Software Quality Research Group. (2007). Web site: <http://quality.eap.gr/>
- Stavrinoudis D., Xenos M., Peppas P., Christodoulakis D. (2005), *Early estimation of users' perception of software quality*, Software Quality Journal, Springer Science and Business Media Inc., Vol. 13, pp. 155-175.
- Xenos, M., Pierrakeas, C., Pintelas, P. (2002), *A Survey on Student Dropout Rates and Dropout Causes Concerning the Students in the Course of Informatics of the Hellenic Open University*, Computers & Education 39(4), pp. 361-377.