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Meltem Huri Baturay
Ömer Faruk Bay
Gazi University
baturay@gazi.edu.tr
omerbay@gazi.edu.tr
Ankara-Turkey

ENHANCEMENT OF USABILITY AND USER FRIENDLINESS OF AN ONLINE LEARNING MATERIAL THROUGH USERS' SUGGESTIONS

ABSTRACT

Current developments in information technologies with computers and the Internet have correspondingly resulted in the explosion of online learning materials. Survival of these materials is concerned with how much they are adopted by the users. The aim of this study is to reveal perceptions of the users towards the usability of an online learning material. The findings of the study are supposed to guide practitioners for improvements on the prototype and guide some others how to implement a usability study in the development phase of an online learning material.

Keywords: Usability, Online, Satisfaction, Perception, Collaborative Learning

BİR ÇEVRİMİÇİ ÖĞRENİM MATERYALİNİN KULLANICI ÖNERİLERİ DOĞRULTUSUNDA KULLANILABİLİRLİĞİNİN VE KULLANICI DOSTU OLMA ÖZELLİĞİNİN GELİŞTİRİLMESİ

ÖZET

Günümüzde bilgi teknolojilerinde İnternet ve bilgisayarlarda yaşanan gelişmeler çevrimiçi öğrenme materyallerinde ciddi bir artışa yol açmıştır. Ancak bu materyallerin ne kadar piyasada kalabileceği kullanıcılar tarafından ne kadar benimsendikleri ile alakalıdır. Bu çalışmanın amacı bir çevirimici öğrenme materyalinin kullanılabilirliğine ilişkin kullanıcı görüşlerini ortaya koymaktır. Çalışmanın sonuçları hem prototipin geliştirilmesine, hem de diğer uygulayıcılara çevrimiçi bir öğrenme materyalinin geliştirilmesi aşamasında nasıl kullanılabilirlik çalışması yapılacağı konusunda rehberlik edecektir.

Anahtar Kelimeler: Kullanılabilirlik, Çevirimici, Memnuniyet, Algı, İşbirlikli Öğrenme

1. INTRODUCTION (GİRİŞ)

With the rapid growth of World Wide Web, a great many online learning materials have been launched. Survival of these materials are mostly determined by investigating users' behaviors towards them and/or their perceptions, since if the users are not satisfied enough with a material, they discard using it and/or delay working on it. Therefore, an eventual success of an e-learning material depends on its continued use after the users' initial use. That is why, it is important for researchers and practitioners to understand the factors influencing the user's intention to continue using an online learning material [1]. Besides, many people avoid technology if they are not comfortable with, and not ready to use, the technology. Therefore, as new technologies are developed, it is important to explore customers' readiness to use them [2].

A usability study assesses how efficient and easy the use of an online learning material is and usability renders how effective it is to help its users to accomplish their tasks with profit and without an excessive load based on the designer's goals and expectations [3]. Satisfaction is the critical factor for the continuance of user-material relationship and its usability. Different models have been suggested for the measurement of users' satisfaction. To exemplify some of these studies claim satisfaction is based on: system quality, information quality and perceived usefulness [4]; besides the latter two measures of Seddon, perceived ease of use [5]; perceived value [6]; usability, quality and value [1]. What these measures mean to users offers the promise of continued user relationships.

Different users have different tastes about the use of online learning materials. It is believed that the following characteristics contribute to any material's quality: a) gathering end-users' feedbacks constantly for material improvement; b) researchers and practitioners working together to understand the current situation, problems and expectations regarding the learning environment; c) researchers, designers and educational technologists cooperative working by blending their expertise in their own fields. Thus, expecting to gain a common perception, the current study aims to get users' perceptions of an online learning material in order improve it for the forthcoming prototype. The prototype have been developed in a LdV project, (ID No: DE/08/LLP-LdV/TOI/147109) and will be improved for the second implementation.

2. RESEARCH SIGNIFICANCE (ÇALIŞMANIN ÖNEMİ)

Survival of the online learning material is concerned with how much they are adopted by the users. Usability studies with users can help in designing an efficient and user-friendly online learning material and its interfaces. The aim of this study is to reveal the kinds of perceptions users have towards the usability of an online learning material which would guide the modifications and improvements to be made on it.

3. THE LEARNING ENVIRONMENT (ÖĞRENME ORTAMI)

The online learning material was developed to be used for teaching UML2, SysML, the differences between UML2 and SysML, requirement engineering and architectural modeling. The content presented cases and interactive exercises. The online courseware run through Moodle platform (called Personal Learning Environment (PLE) hereafter) and included a set of learning resources and the integrated tools StudentUML[7,8] and PENCIL. The characteristics of the tools were as follows: (a) PLE: It was an open-source course management system used for structuring courses, announcements, general information, contact information, etc. It worked as an entry point for the users and guided them to StudentUML, PENCIL and a set of learning resources; (b) StudentUML: For direct application of theoretical knowledge, StudentUML provided opportunities for creating

different UML diagram types as part of exercises. It was an educational tool that aimed to provide students with a simple yet effective tool that meets their learning needs. The students were expected to do all exercises provided through StudentUML; (c) PENCIL: Yang & Liu stated that with the development of computer and communication technologies, pedagogic strategies in the traditional classroom are stretched to the virtual learning environment [9]. PENCIL was a social learning tool that enabled learners and tutors to share their solutions. The goal of PENCIL was to foster collaboration in terms of discussions about solved and partly solved exercises either via comments or suggestions of alternative solutions by fellow learners or tutors. The students were expected to join the collaborative exercises in PENCIL. Instructors, made sure that all students were working on the same exercises and in English; and (d) A Set of Learning Resources: It consisted of all the learning content, which can either be text (e.g., HTML, PDF, etc.) and pictures or other multimedia material for self-studying. The learning material also included many different exercises offered in many different variants which ranged from browser-based multiple choice tests, with direct, computer-generated feedback for the learners, to complex tasks. Tutors monitored and checked if the students were studying on these resources.

4. METHODOLOGY (METOD)

The researchers carried out both qualitative and quantitative research methodology. The aim of the research was to reveal the kinds of perceptions learners have towards the usability online learning environment which would guide the modifications and improvements to be made on the environment. Marshall and Rossman defined that qualitative paradigm involved with complexity of social interactions as expressed in daily life and with the meanings the participants themselves attribute to these interactions [10]. Reeves, on the other hand, emphasized the need of quantitative paradigm by stating that there can be value in seeking to quantify measures and added that whereas it was not always possible to represent people and the complexity of social interactions with clearly defined variables [11]. Thus, he suggested the mixed approach, both quantitative and qualitative methods for handling the complexity of modern society and technology for its capability. The current study included both the analysis of clearly defined measures and interpretations of participants concerning an online environment.

4.1. Data Collection Instruments (Veri Toplama Araçları)

The learning environment was considered from the point of usability, practicality and effectiveness of its pedagogical and overall design through a checklist. The purpose of the checklist was to measure how users' found the online learning material with the tools StudentUML, PENCIL and the Personal Learning Environment. Therefore, the checklist both included a five-point Likert-type scale of potential responses: don't know / not applicable(0), completely agree(5), agree(4), partially agree(3), disagree(2), and strongly disagree(1), with the assigned values ranging from 5 to 0 and a comment section for almost each item to gather qualitative data concerning users' perceptions of the material. The checklist consisted of subscales of overall design, pedagogical design of the material and some items regarding satisfaction of users. Satisfaction subscale included 4 questions that were adapted from Hong and Holton [12].

A few questions in the checklist were adapted from the questionnaire developed in the previous project Up2UML [13]. Besides, a Delphi data collection process was carried out with the experts (embedded-system experts, model-based software developers, distance education experts and/or educational technologists) in order to identify the checklist item, which was believed to contribute to the validity of the research outcomes. The

Delphi technique utilizes the knowledge of experts, combining it and redistributing it [14].

4.1.1. Sampling (Örneklem)

The users of the system included 42 volunteer students from Turkey and other European countries (Greece, Spain and Sweden). All users were computer literate and had at least intermediate level of English. The demographic information regarding the participants is as follows;

The number of male students (N=34) was greater than the number of female students (N=8), and the majority of the students' were below 36 years of age. In addition, the largest group of the students (N=12) were postgraduate/ PhD students. More than half of the users (N=28) had professional background in computer science.

4.1.2. Procedure (Prosedür)

Prior to the release of the personal learning environment and implementation of the checklist with the survey, some arrangements were made. Participants who could communicate in English were identified. The checklist was translated into English and put on the online Lime Survey. An introductory meeting with all participants was conducted by the instructors. Participants were helped with the system problems, bugs and difficulties and they were reminded of and encouraged to ask questions in English in PENCIL to enable communication or collaboration. In case of a conflict between students and their solution, the instructors provided resolving feedback and concrete solutions in cases one was not found already. Participants were announced to:

- Participate regularly for the minimum agreed time (eg 1 hour) during the whole validation period,
- Work through learning resources,
- Work on exercises by using StudentUML and PENCIL intensively, work on the solutions in a Web 2.0 way that meant giving feedback as often as possible and asking questions whenever they had a problem,
- Check back from time to time on a day for a few minutes in order to see provided feedback by tutors or other learners,
- Look at solutions of other students and provide feedback (alternatives, hints, etc.) whenever possible,
- Comment on solutions of other students,
- Create new solutions based on other people solutions (branches), i.e. provide alternative steps (reminded of not creating whole solutions for others),
- Fill in the checklist on the Lime-Survey after education was over.

5. RESULTS (SONUÇLAR)

5.1. Results of Descriptive Statistics (Betimsel İstatistik Sonuçları)

Table 1 shows the descriptive statistics (number, mean, and standard deviation) regarding the variable 'overall design'. Table 1 demonstrates that users mainly preferred studying on the always accessible and time-flexible web-based content (mean=4.2). This choice was followed by the choices 'The web-based material is user friendly' (mean=3.7) and 'The instructions on the web-based material are clear' (mean=3.8) which indicated that users found the material user-friendly. The item 'I had some technical problems while using the web-based material' was partially agreed by the users.

Table 1. Descriptive statistics of overall design subscale scores
(Tablo 1. Tüm tasarim alt ölçeği betimsel analiz sonuçlari)

Overall Design	N	M	SD
The web-based material is user friendly	41	3,7	0,9
The instructions on the web-based material are clear	41	3,8	1,0
It is easy to navigate through the content	42	3,2	1,1
Loading time of the content is appropriate	42	3,4	1,0
I had some technical problems while using the web-based material	41	3,0	1,3
I liked studying on always accessible and time-flexible web-based content	42	4,2	0,8

N: Number of students who attend the study
M: Mean scores
SD: Standard Deviation

Table 2 indicates the descriptive statistics regarding the pedagogical design of the material. The results (above the mean 3.6) denote that all users were satisfied with the learning environment with its tools. They particularly liked interacting within a community of learners, discussing the exercises and solutions (mean=4.2) and problem solving exercises were helpful more (mean=4.1) than multiple choice questions (mean=3.8) to their comprehension. They found the modeling tool easy to learn and use and the PENCIL helpful to their learning. They liked receiving feedback from the tutor. They agreed that the feedback they wrote contributed to their comprehension (mean=4.0).

Table 2. Descriptive statistics results of pedagogical design subscale scores
(Tablo 2. Pedagojik tasarim alt ölçeği betimsel analiz sonuçlari)

Pedagogical Design	N	M	SD
Feedback from other users was helpful to my comprehension*	39	3,9	0,8
Feedback I wrote was helpful to my comprehension*	34	4,0	0,7
Feedback from the tutor was helpful to my comprehension*	34	4,0	0,9
Discussing the exercises & solutions contributed to my	37	4,2	0,8
I enjoyed interacting with the community of learners*	38	4,2	0,8
The modeling tool is easy to learn and use**	41	4,2	0,8
The consistency checking capabilities in the modeling tool helped me better understand the relationships between UML	35	4,0	0,9
Instant feedback mechanism of StudentUML helped me to learn from my mistakes**	35	3,9	0,8
StudentUML was helpful to me**	40	4,2	0,7
PENCIL was helpful to me*	36	4,0	0,8
Learning Resources (Content) was helpful to me***	39	3,8	0,8
Multiple Choice questions were helpful to me***	36	3,8	1,1
The combination of online material and collaboration/exercise tools motivated me to study***	36	3,9	1,0
I found the multiple choice questions more helpful to my comprehension***	33	3,6	0,9
I found the problem solving exercises more helpful to my comprehension***	36	4,1	0,8

*The items refer to PENCIL
**The items refer to Student UML
***The items refer to PLE

Table 3 indicates users' perceived satisfaction levels regarding the online learning material. Users' choices indicated that a great many of them found that working through the exercises increased their understanding of UML (mean=4.2); using online resources increased their understanding of UML (mean=4.1); the example diagrams increased users' understanding of UML (mean=4.0) and that they could identify gaps in their knowledge base and address these as learning issues (mean=3.9). Users had positive feelings towards all satisfaction items and there were insignificant differences in the mean scores of satisfaction subscale items.

Table 3. Descriptive statistics results of satisfaction subscale scores
(Tablo 3. Memnuniyet alt ölçeği betimsel analiz sonuçları)

Satisfaction*	N	M	SD
I found that working through the exercises increased my understanding of UML.	39	4,2	0,7
I found that the example diagrams increased my understanding of UML.	39	4,0	1,0
I could identify gaps in my knowledge base and address these as learning issues	35	3,9	0,8
I found that using the online resources increased my understanding of UML.	40	4,1	0,9

*The questions under satisfaction are adapted from Hong and Holton (2003).

5.2. Users' Perceptions Regarding the Online learning material's Usability (Çevrimiçi Materyalin Kullanılabilirliği Üzerine Kullanıcı Algıları)

The users' perceptions regarding the overall design of the material all positive except for some users who have required of: (a) big figures; (b) revised instructions; (c) interoperation of three tools more smoothly; (d) more functionality in PENCIL for displaying and searching solutions/exercises; need of navigating through the pages –back & forward; (e) a document describing the whole system and how parts are connected; (f) faster StudentUML and PENCIL without loading problems; (g) not saving problem; (h) no problems with opening or sharing solutions; (i) not a short course which gives plenty of time the users to learn by asking, replying, that is, sharing. Time limited the user to revise all solutions; (j) merged Students UML, PENCIL in PLE so there will be no need of the confusing and not user-friendly links; (k) improvement of time consuming navigation. A user stated regarding navigation that "Navigation is awful. I believe that this is due to the fact the one part is done in flash which has no idea what history is, and that the other is done with a java applet, which has the same problems with the history!" Another one supported this "…difficult to switch back and forth to read text…". And another repeated the same concern "It was extremely annoying to navigate in. Ex. when you look at someone's solution to a problem, and just want to go back to the list of solutions. How do you even do that? I had to make the search for the solutions again, which take time." A user complained about functionality "You can't chose "display solutions" and then go back to look at another solution. You must make a new search after "all exercises" and then chose another solution to look at." Similarly, another one claimed that "The only thing you can do in Pencil is to search after solutions/exercises. I think there could be one button for solutions and one for exercises and maybe a dropdown list for "only mine" and "all results". Concerning loading time of the content, a user uttered that "Java applet takes about 40 seconds to load on a 1.6 GHz processor with 1GB of RAM. Flash loads in about 15-20 seconds, not a terrific loading speed, but more acceptable than the java applet." Another user declared that the course was so short by asserting

"One of the good ways of learn is learn by asking (and being asked), and this was nearly impossible with this calendar, job, and lots of solutions to review." A user suggested merging three tools "I actually do not seem to realize why there are three tools?? I mean we have pencil, moodle and StudentUML. Isn't it possible just to merge everything in one tool and not to have links like, log in to moodle, log in now to pencil, see the exercise in pencil and now see it in moodle...it kind of doesn't make sense.. :S". Another user supported it "Composing several different systems into one caused me a lot of confusion initially, and I had to spend a lot of time just learning where everything I needed was and how to get there. This made me very unmotivated to try and get started."

The users' perceptions regarding the pedagogical design of the learning material were investigated through some specific items particularly on collaborative learning and the material's effectiveness of teaching the content. The users' suggestions for the improvement of PENCIL were: (a) longer time to discuss and write feedback; (b) more feedback of the tutors; (c) support for more interaction; (d) opportunity to see the diagrams while commenting; (e) unlimited thread visibility. Similarly, users have some recommendation for the improvement of StudentUML: (a) extra explanation regarding its features and choices (e.g bidirectional); (b) should support UML2, full class and sequence diagrams; (c) more functionality; (d) need improvement at dragging, dropping and rendering of the components; (e) more time dedicated working on it. Finally, regarding Personal Learning Environment users have suggested: (a) more clear guides on learning concepts (e.g. class diagram relationships); (b) explanation for right and wrong answers; (c) more explanation of the use of tools. A user stated that some aspects of the StudentUML was very easy to understand and use "There were some things I didn't know how to do, but I can't tell if that's because those features weren't implemented or if they were just difficult to figure out." Similarly, another stated that "It took about 10 min until I understood how the others could make just a line and not an association arrow. There is no explanation to the different choices you can make. For example 'Bidirectional'". A user has some suggestions regarding StudentUML "I like StudentUML. I feel that there is a lot to be improved, especially the draging and droping and the rendering of the components. I propose for you to start using the Visual Library in NetBeans Platform 6.0, it contains many readymade components which will be really useful for drawing graphic diagrams."

The users' perceived satisfaction levels were as well investigated. The users suggested that there should be: (a) less material run more smoothly and slowly; (b) more diagrams with their explanations.

6. DISCUSSION (TARTIŞMA)

The findings indicated that although users had positive thoughts and perceptions regarding the learning material, they have some suggestions for improving it. These were involved with: the interfaces of the material (e.g. navigation buttons); addition of revised instructions, extra explanations; technical ones (e.g. less loading time); more dedicated time to study on it; a handout explaining the use of the system and its tools. Besides, there were some other suggestions concerned with the pedagogical design of the material: more feedback, more functionality, more interaction, more clear learning resources, explanation of right and wrong answers, more diagrams. The users required problem free running material with smooth passes among the tools. None of the participants expressed negative opinions about collaborative working environment 'PENCIL'; but, they liked the continuous interaction there although they had some technical problems.

We expect that these results may be useful towards the improvement of the function of the online learning material, in order to offer a user-

friendly (easy to use) and efficient (helping learners to collaboratively learn and do practice) learning environment. Rigutti, Paoletti & Morandini state that only if current knowledge on human perception and cognitive processes are appropriately applied to innovative design stages, higher quality standards will be achieved [9]. Therefore, these results are very necessary to the practitioners for the improvement of any material.

7. CONCLUSION (SONUÇ)

With the rapid growth of information technologies in the arena of education, a great many online learning materials have been launched. Survival of these materials is mostly dependent on users' satisfaction; unless users are satisfied enough with a material, they discard using it and/or delay working on it. Therefore, an eventual success of an online learning material depends on its continued use after the users' initial use. Researchers and practitioners have been trying to understand the factors influencing the user's satisfaction of an online learning material and their intention to continue using it. The current study, similarly investigated the perceptions of the users of an online learning material and their satisfaction levels.

The findings of the current study helped the practitioners who were in the development team of the material by pointing out the parts to be improved. This study could be used as a guide or model to other practitioners how to implement a usability study in the development phase of a material, tool or system.

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