

# USABILITY TESTING OF DEPARTMENTAL WEB SITES: A CASE STUDY WITH AUTHENTIC USERS AND AUTHENTIC TASKS

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## Abstract

The purpose of this study is to determine usability problems of a university departmental web site by authentic users and authentic tasks and also to suggest solutions to these problems. The study group consisted of 9 participants including 4 undergraduate students and 5 academicians (4 research assistants who are graduate students and one instructor). Study is designed by recording the process of authentic task performance of authentic users in departmental web site and analyzing these records. Seven participants' task performance processes were recorded on computer by Captivate program as a video feed including mouse clicks and timeline. In addition, two participants' task performance processes and eye movements during this process were recorded by an eye tracking machine. In the data analysis, recordings from task process were analyzed and the issues for which users had difficulties with, the issues which users hesitated while performing, the time spent on each task, repeated tasks, successful and unsuccessful tasks were discovered comparatively with observer notes. Also eye tracking data were analyzed according to number of fixation and fixation length data on area of interest regions. Usability problems are determined based on the findings, and solutions to these problems are suggested.

Keywords: Usability, educational interfaces, authentic users, authentic task.

## 1 INTRODUCTION

Nowadays, it has become important to ensure the effective usage of various artifacts such as electronic or non-electronic devices, kinds of systems, web sites, and software, which have a potential of being used by a specific target user group and which are produced for serving to a specific goal. Issues such as adoption of these artifacts, decision to use and maintaining usage, usage without problems or errors, correct usage for intended goal, providing effective outcomes and interaction between product and user seem to be related with usability.

Although usability has been defined in different ways, it was suggested that this term is originally derived from the term of user-friendliness and there are many different approaches to how usability should be measured as a result of this definition variation [1]. [2] has defined usability on the basis of acceptability and suggested this acceptability as a combination of social acceptability and practical acceptability. [2] also stated that usability has five kinds of attributes: learnability, efficiency, memorability, errors and satisfaction. Moreover, [3] defined usability of a system as "the capability in human functional terms to be used easily and effectively by the specified range of users, given specified training and user support, to fulfill the specified range of tasks, within specified range of environmental scenarios" and suggested attributes of usability as effectiveness, learnability, flexibility and attitude.

Different methods and techniques can be used to conduct usability depending on evaluation purpose and number of participants. Some methods such as performance monitoring yield statistical data which can show where most problems occur, but they do not diagnose problems or recommend solutions to these problems. Some others, however, aim to provide designers with more incisive diagnosis which can suggest re-design [4].

Different usability evaluation methods and techniques have advantages and disadvantages among others. Scriven (1967) made a distinction between two basic approaches to evaluation based on the objective as formative evaluation and summative evaluation [5]. Formative evaluation is defined as evaluation done during development to improve a design while summative evaluation is defined as evaluation done after development to evaluate a design.

Usability is important not only for products that are hardware-based such as instruments, devices or electronic tools, but also for software, interfaces and types of programs designed to be used by humans. [6] stated that the success of interfaces and websites is dependent upon how usable they are, and if users can not use a web site's interface comfortably or easily they won't be able to complete their task on the site. In addition, although there is a misconception that usability of web sites without a commercial concern is not important, usability is an important issue for all web sites to achieve goals. For example, web sites in educational contexts like school or university web sites and other academic sites have an informative and guidance function for students, teachers, academicians and other members of this process. For that reason, their usability concern is essential.

From this perspective, dealing with a university departmental web site (Hacettepe University, Department of Computer Education and Instructional Technology/ [www.ebit.hacettepe.edu.tr](http://www.ebit.hacettepe.edu.tr)), this study aimed to determine usability problems of this site by authentic users and authentic tasks and also to suggest solutions to these problems.

## **2 METHOD**

### **2.1 Study Group**

While selecting the study group, it is considered that the people in the study group must represent whole target user group of this site. For that reason, the study group consisted of 9 users, 4 of whom were undergraduate students at different levels and 5 academicians. There were 5 female and 4 male participants, and their age ranged from 18 to 46. All of the participants were selected voluntarily from the Computer Education and Instructional Technology Department.

All of the undergraduate students and most of the academicians stated that they access department's web site several times a week at home or at campus. Moreover, it was indicated that while undergraduate students use department web site mostly for following announcements and to look for e-mail addresses of their lecturers, academicians use web site mostly for following the latest publications of academicians in the department.

### **2.2 Task Selection**

Since some of the participants were undergraduate students and some of them were academicians, two different task groups were formed considering differences in purposes and activities between these two groups

The following issues were taken into account while designing tasks; a) tasks must be familiar with daily life tasks of users, b) tasks must be from favorite tasks of users, c) each of the tasks must deal with a different element, menu or content of the site, and d) tasks don't contain very similar steps with one another. As a result, a total of 15 tasks were formed, 8 of which were for undergraduate the student group and 7 of which were for the academician group.

### **2.3 Data Collection Tools and Procedures**

First, a demographic information form was used for collecting data about participants' age, gender, grade/position, frequency of access to web site, access location and their prevailing purposes on the web site.

In the second stage, participants were placed at a computer with required adjustments (resolution, light, internet connection, recording program) and they were given instructions about tasks that they will perform on the web site. Task performing process was recorded with Captivate program at the background on computer and also observed by a researcher. Captivate program records as a camera all the actions and movements (clicking, writing, mouse pointing, dragging, selecting, and etc.) of a user.

Last, one participant from the undergraduate student group and one participant from the academicians were taken to a human-computer interaction laboratory to do tasks on an eye tracker integrated computer. While participants were doing tasks, their eye movements were recorded by Tobii 1750 eye tracker at a screen resolution of 1280x1024 and a sampling rate of 50 Hz.

## 2.4 Data Analysis

Frequency calculation was used for demographic information analyses in the first section. Recordings from task process were analyzed in the second section of authentic task assessment, and the points which users had difficulties, points which users hesitated while performing, time spent for each task, repeated tasks, tasks being completed successfully and unsuccessfully were discovered comparatively with observer notes. In the last section, seven areas of interest (AOI) (content, language and homepage, university homepage link, additional links, page title, main menu, logo links) were determined on the homepage to analyze eye movement data. Number of fixations, fixation time and heatmap were analyzed by Tobi Studio 2.0.5 software. A screenshot of homepage (left) and area of interests (right) are presented in Figure 1.

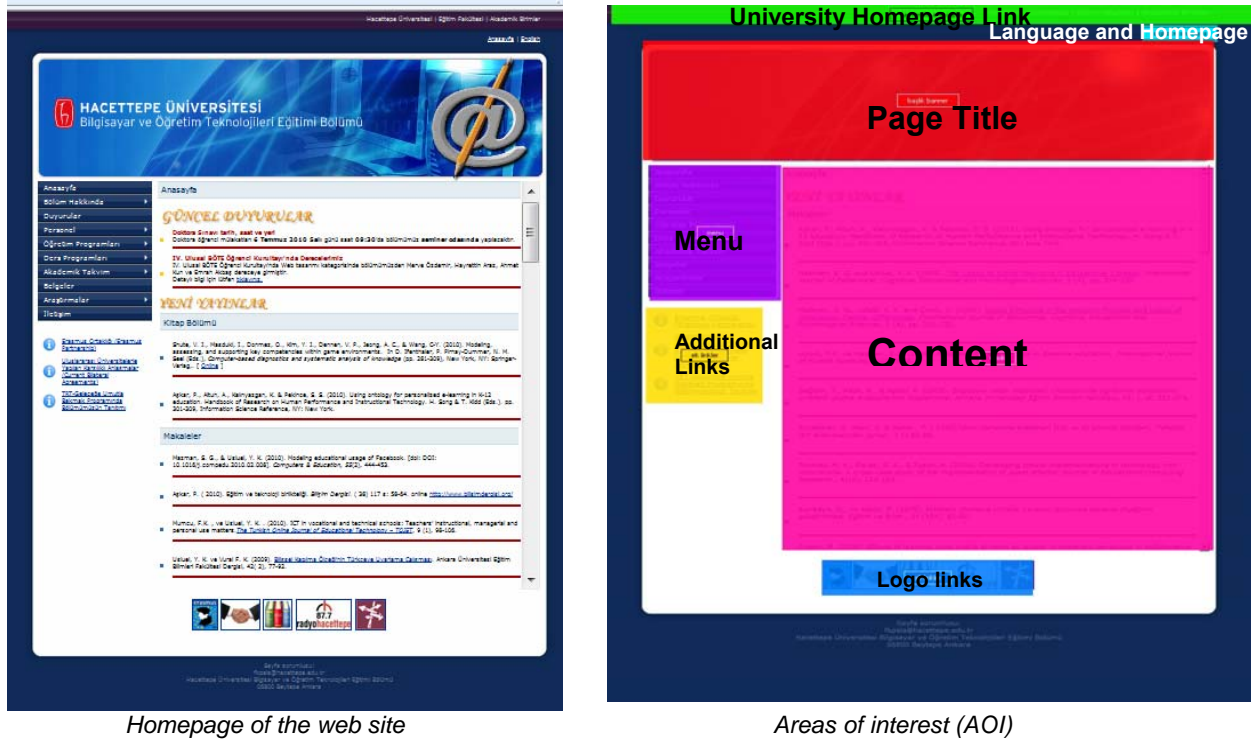


Figure 1: Homepage and Area of Interests on the page

## 3 FINDINGS

Three undergraduates' and 4 academicians' task processes were recorded synchronously with Captivate program, while one undergraduate's and one academician's task processes recorded with eye tracker and data were analyzed separately. Successful and unsuccessful tasks, completion time of each task, and main problems were obtained from captivate program recording and successful and unsuccessful tasks, completion time of each task, number of fixations, length of fixation, heatmap, and gaze plot were obtained from eye tracking.

### 3.1 Findings from task analysis of undergraduate students

Findings from captive recordings of undergraduate's task process are presented in Table1 and Table2.

Table 1: Task completion time (second) of undergraduates

Participants	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7	Task 8	Total	Average
1	17,49	7,35	7,14	26,50	9,94	14,49	10,62	57,89	151,42	18,93
2	7,15	15,39	31,25	28,77	9,26	9,56	5,25	40,53	147,16	18,40
3	13,93	6,00	9,15	29,51	12,05	6,55	5,31	28,25	110,75	13,84
4	10,45	73,04	26,92	40,21	14,58	23,75	10,86	175,84	375,65	46,96
<b>Average</b>	12,55	25,45	18,615	31,24	11,45	13,58	8,01	75,62	196,24	24,53

Table 2: Successful (√) and Unsuccessful (X) Tasks of Undergraduate Group

Participants	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7	Task 8	Successful	Percentage of success
1	√	√	√	√	√	√	√	X	7	87,5%
2	√	√	√	√	√	√	√	X	7	87,5%
3	√	√	√	√	√	√	√	X	7	87,5%
4	√	√	√	√	√	√	√	X	7	87,5%

Undergraduate student group completed task 7, "finding new year holiday from calendar" in the shortest time with an average of 8,01 seconds. Task 8, "accessing social students groups", took the longest time with an average of 75,63 seconds and could not be achieved by any of the students. In addition, task 4, "controlling a classroom if it is available or not at a given time", took relatively longer among other tasks with 31,24 seconds because the task required scroll bar usage more than once. Undergraduate student group completed all tasks in 196,24 seconds with an 87,5% success rate.

General usability problems that were encountered by undergraduates, frequency of these problems and solutions/suggestions to these problems are presented in Table 3.

Table 3: General problems in student tasks and solutions/suggestions

Problem	Frequency	Solution
Visual logo links were not noticed by users.	4	Additional textual explanations could be added to logos (on mouse over) or these logo links could be relocated under main menu links.
"Lectures program" and "courses schedule" concepts were generally confused with each other.	2	"Lectures program" could be replaced with the term "lectures catalogue" to make a clear distinction.
While checking for available classrooms, participants forget to check for both undergraduate and graduate course schedules.	3	A schedule for status of classrooms and laboratories can be added.

### 3.2 Findings from task analysis of academicians

Findings from captive recordings of academicians's task process are presented in Table 4 and Table 5.

Table 4: Task completion time (seconds) of academician group

Participants	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7	Total	Average
1	30,87	18,62	33,47	6,84	9,13	8,37	7,56	114,86	16,41
2	30,62	33,04	40,50	14,70	8,92	21,46	68,10	217,34	31,05
3	28,42	63,34	26,58	18,98	7,57	13,04	37,1	195,03	27,86
4	15,00	14,64	18,47	7,76	2,45	18,94	28,76	106,02	15,15
5	29,46	24,31	20,61	13,06	14,35	40,38	11,16	153,33	21,90
<b>Average</b>	26,87	30,79	27,92	12,268	8,48	20,43	30,82	154,02	22,48

Table 5: Successful (√) and Unsuccessful (X) Tasks of Academician Group

Participants	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7	Successful	Percentage of success
1	√	√	√	√	√	√	√	7	100%
2	√	√	√	√	√	√	X	6	87,7%
3	√	X	√	√	√	√	√	6	87,7%
4	√	√	√	√	√	√	X	6	87,7%
5	√	√	√	√	√	√	√	7	100%

Task 7, "accessing library web site", took the longest time with an average of 30,82 seconds and could not be achieved by two of the academicians. In addition, task 2, "searching for national and international papers of one of the faculties", took relatively longer time among other tasks with 30,79 seconds and further one of the participants couldn't accomplish this task. Academicians completed task 5, "finding contact information of secretary" in the shortest time with an average of 8,48 seconds. Academicians completed all the tasks in 154,02 seconds with a 92,62% success rate.

General usability problems that were encountered by academicians, frequency of these problems and solutions/suggestions to these problems are presented in Table 6.

Table 6. General problems in academicians tasks and solutions/suggestions

Problem	Frequency	Solution
Visual logo links were not noticed by users.	4	Additional textual explanations could be added to logos (on mouse over) or these logo links could be relocated under main menu links.
“Lectures program” and “courses schedule” concepts were generally confused with each other.	2	“Lectures program” could be replaced with the term “lectures catalogue” to make a clear distinction.
Researches link on academicians’ personal pages could not be noticed and researches were looked for on the main page of academicians.	4	All of the information categories in academicians’ personal pages could be categorized under links, or researches information could be placed on the main page additionally.
While searching for a word on a page, participants used Ctrl+F combination.	3	An in-site search engine could be integrated to the web site, and a search function by keyword, author name, date, and etc. for publications and theses could be added.
The link of the documents is confused with the link of publications	2	Instead of “publications”, the term “theses” could be used.

### 3.3 Findings from eye tracking

Number of fixation, length of fixation, heatmap and gazeplot data were used to analyze eye tracking data. Number of fixations and fixation lengths on each area of interest are presented in Table 7 and Table 8.

Table 7: Number of fixations on each area of interest

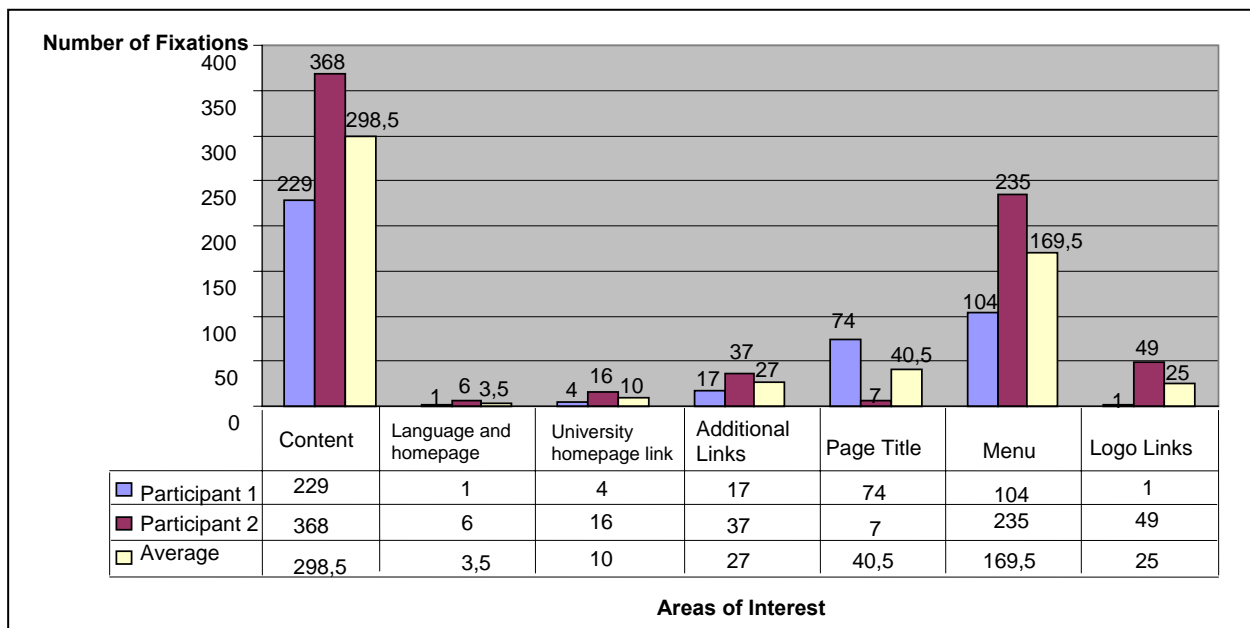


Table 8: Length of fixations on each area of interest

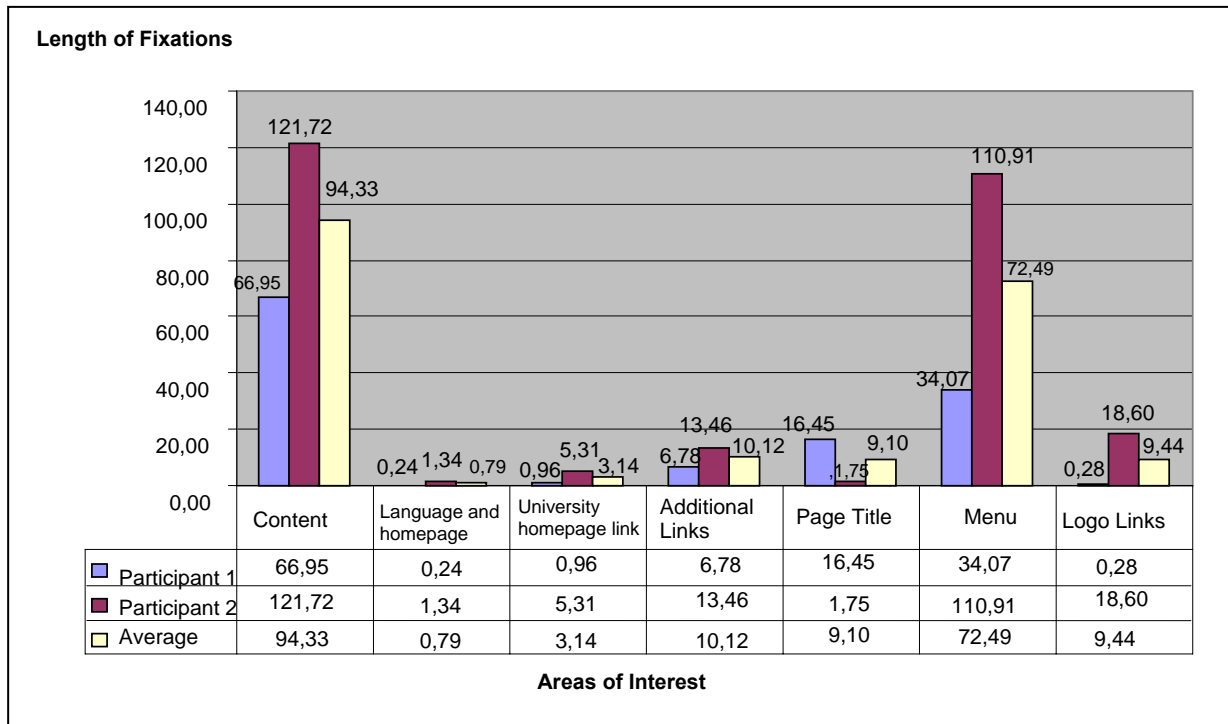


Figure 2 shows the heatmap of the homepage for two participants across all tasks



Figure 2: Heatmap of homepage

Fixation length is the amount of time a particular element of a design is viewed. This may reflect the importance of an element to a user, or indicate that the user is having difficulty with extracting information. Fixation number is the number of times eyes focus on a particular location. As seen in Table 7, Table 8, and Figure 2, participants mostly and frequently viewed and fixated on “content area”

and “menu area”. It can be concluded from this finding that these revealed out as the most viewed and focused areas since all of the tasks required to use main menu and all of the content was displayed in the “content area”..

Heatmap of the task process showed that the page title area, which includes department logo, department name, and links to the “university homepage” and “department homepage”, and logos area at the bottom of the page, which includes links to the “university library”, “university radio”, “erasmus partnership web page” and “social student clubs page”, were viewed and focused almost equally.

Logo links at the bottom of the page and some additional links can be only seen when vertical scrollbar is used. On the other hand, although page title area occupies nearly 25% of the screen, this area was rarely viewed and focused since it did not include any link or content. From this, it can be concluded that home page area is not designed effectively and some of the areas unnecessarily occupy a wide space.

#### **4 CONCLUSION AND SUGGESTIONS**

A usability study of an educational web site has been conducted. This study contributes to the literature by using different usability evaluation methods together, since it used authentic task recording and eye tracking methods together. [7] stated that using eye tracking is beneficial especially when combined with traditional usability techniques. Since eye tracking provides objective data about internal processes, it can support subjective data that are obtained by content analysis, introspection, think aloud or other subjective methods.

Examining usability problems of the web site showed that neither the student group nor the academician group encountered significant problems. Almost all of the tasks were completed successfully by both groups. Apart from that, some specific usability problems were found with completion time of some tasks.

The task which was not completed successfully by most or completed in a very long time by both academician and student groups was “going to the required web page (library for academicians and social students group for undergraduates) by using logo links”. The main reason for why most of the participants had difficulty with this task could be a lack of any textual description over logos. Moreover, since these logos are placed at the bottom of the page and could not be seen at the first sight without scrolling vertically, participants failed to notice these visual links. Eye tracking data also showed that participants mostly focus on main menu on the left first and then look for the content. Since the mostly used and focused parts are these two areas (menu and content), the bottom of the page in which the logos were placed did not attract attention and was not viewed or focused for any function. This result implies re-designing some parts of the homepage.

After determining usability problems of this site, solutions/suggestions were made with regard to both students’ and academicians’ problems. In addition to these suggestions, some other suggestions are made below:

- Adding a site map, developing a standard template for faculty members’ page,
- Adding a general communication form,
- Standardizing fonts, size and colors of text on all of the pages,
- Adding a gallery/multimedia section, which introduces the department to others,
- Adding a menu, this contains links to department’s moodle, wiki and blog tools for easy access.

#### **REFERENCES**

- [1] Folmer, E. and Bosch, J. (2004). Architecting for usability: A survey. *The Journal of Systems and Software* 70(1). 61–78.
- [2] Nielsen, J. (1993). Usability engineering. Academic Press, Boston, MA. Retrived from <http://books.google.com.tr> on 22.11.2009.



- [3] Shackel, B. (2009). Usability - Context, framework, definition, design and evaluation. *Interacting with Computers*, 21(5-6). 339-346.
- [4] Doubleday, A., Ryan, M., Springett, M., & Sutcliffe, A. (1997). A comparison of usability techniques for evaluating design. *Proceedings of Designing Interactive Systems (DIS '97) Conference*. New York: ACM Press, 101-110.
- [5] Hartson, H.R., Andre, T.S., & Williges, R. C. (2001). Criteria for evaluating usability evaluation methods. *International Journal of Human-Computer Interaction*, 13(4), 373-410.
- [6] Pero, K. (2003). Retrieved from <http://www.usableinterface.com/articles/whyusability.php>'den on 25.12.2009.
- [7] Namahn (2001). Using eye tracking for usability testing. Retrieved from [www.namahn.com/resources/documents/note-eyetracking.pdf](http://www.namahn.com/resources/documents/note-eyetracking.pdf) on 29.12. 2009.