Chapter 13
Usability Evaluation of the Mobile Application of Centralized Hospital Appointment System (CHAS)

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Abstract The aim of this study is to evaluate the usability of the mobile application of Centralized Hospital Appointment System (CHAS) developed by the Ministry of Health in 2012, as part of e-government efforts in Turkey. A study group was formed consisting of 16 people, 8 females and 8 males between the ages of 18 and 55, and selected for their CHAS experience. Qualitative and quantitative methods were used as part of a mixed research design. Qualitative data sources for the study consisted of observation notes taken while performing authentic tasks that were selected through field research, notes generated by the think-aloud method and meeting notes taken after the process. Quantitative data were collected with a performance evaluation form and questionnaire. Researchers analyzed the data using SPSS 21 program for the quantitative data, and using Microsoft Word and Excel for the qualitative data derived from the participant group. Descriptive analysis, nonparametric chi-square test (single sample with two variables) and Kruskal-Wallis H Tests were used for the quantitative analysis of the data. Moreover, a content analysis method was used for the qualitative analysis of the data. Results of the data analysis indicated that participants of both male and younger groups performed better than others, which was significantly distinctive and matched other literature related to the usability of technology in the many tasks performed by the application. In addition, participants who had experience of using touch-screen devices and were of higher educational status were found to be statistically significantly more successful than other participants. Findings derived from the study indicate that the general specifications and interface of the CHAS mobile application are beneficial and necessary for accessing the medical services. Conclusions also suggest that the application would be easier and more effective to use after the suggested revisions have been made.

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1 Introduction

Information and Communication Technologies (ICTs) have been widely used for many domains such as government, health, and some others [1]. Governments take advantage of ICTs to complete the e-government strategies in order to provide better service for the citizens and to eliminate existing bureaucracy, therefore achieving significant economic and operational efficiencies [2]. The Internet, delivering information and enabling online transactions, has been a convenient and cost-saving channel for governments. E-government systems can help with planning the government departments and harness the right technology and networks that are critical in facilitating agile, secure, reliable, and compliant Information Management Systems [1]. Different e-government services, which are used on various platforms, have emerged in parallel to the e-government efforts.

With the rapid developments in ICTs, new types of technological devices emerge and make our lives easier. Mobile devices can be regarded as the most important ones among these. Mobile devices accompany users in different environments all day long. Unlike desktop devices, mobile devices are very light and can be carried by users. Cultural environments in which users live and life's necessities shape the use of mobile devices [3]. The first devices that come to mind when we speak of mobile devices are smartphones, tablets, laptops, and palmtop computers. Smartphones, owned by almost everybody in every section of modern society, are the indicators of the improvement in the mobile market. Although they were regarded as great innovations a couple of years ago [4], smartphones became a necessity for many people and gained an important place in their daily lives since they provide freedom, enable one to access information and provide immediate feedback for communication. The fact that these devices, which make it possible to access information anytime and anywhere, are continually developing new features is inevitable [5].

The most recent evolution of cellphones is that they can be accessed and used easily to suit the needs of a person through the applications developed on these platforms. Human-Computer Interaction examines the relationship between humans and machines. Studies conducted to examine the usability of mobile applications in Human-Computer Interaction increased in number as mobile devices were developed, and many new applications emerged. New competition arises with these technological innovations and various companies launch mobile devices with various specifications. While these specifications include various screen sizes, resolutions, and operating systems, a more important factor is the usability of the mobile technology [6]. Among the characteristics that are related to usability are: adapting to the mobile devices, the ability to continue using them, the elimination of hardware and software problems, and enabling user interaction [7].

It is now possible to perform daily routines, such as shopping or making reservations at any time and from anywhere, with the latest mobile devices and infrastructure. A user can access many services with his/her mobile device from wherever he or she is. Usage rates for mobile technologies in the healthcare industry have increased in recent years and applications have been enhanced in terms of usability and popularity [8, 9]. For example, Apple had 13,000 mobile applications related to healthcare in 2012 [10]. Improving health services in Turkey and the world is gaining importance, and significant studies related to health practices based on technology are being conducted [11].

In this context, the Ministry of Health of the Republic of Turkey took the first steps of e-government towards a Centralized Hospital Appointment System (CHAS), bringing medical institutions and citizens together under the "Health Transformation Program" in 2009, to present citizens with the opportunities that time and technology allow. Following the pilot studies in 2012, patients were provided with the opportunity to choose a doctor from second- or third-grade medical institutions using the ALO 182 call center, the web site, and the mobile application [12]. With this system available to all citizens, patients could make appointments for any time at any hospital in accordance with their healthcare needs, the working hours of the doctors, and their workload.

Studies highlighted that mobile applications used in the healthcare industry have certain limitations and need to be developed in terms of their interaction [13]. In this context, this study aims to analyze the usability of the CHAS mobile application—where the target audience is any citizen—in terms of the authentic tasks assigned to the participants. After performing these tasks, participants highlighted the issues affecting its usability and made suggestions for solutions to these issues. Figures 13.1 and 13.2 show user interface of the CHAS mobile application.

Fig. 13.1 Main screen CHAS Mobile application

Fig. 13.2 Appointment screen of CHAS Mobile application

1.1 Usability

Usability has various definitions in academic and commercial studies [14]. These definitions include the following:

- Target audience's ability to use the system effectively and easily after being supported or trained to perform certain tasks [14],
- The ability the user shows in helping him or her perform a task using a tool in an environment,
- Usability is an indicator of how well technology has been adapted in the applications [15].

What these definitions have in common is related to how easily people will adapt to the technology [6]. Usability tests are conducted with the think-aloud method and this method is based on the studies of Ericsson and Simon [16]. Process of conducting the usability test is as follows:

- Tasks are set,
- Tasks are assigned to the users in a task environment—specified as a laboratory or field study—and the participants are asked to think aloud while exploring the application interface,
- Information necessary for usability is collected as the participants think naturally (aloud). The researcher can either record these or take notes [16].

The usability tests are typically aimed at observing the users while they are using the software, or hardware, and detecting any problems arising as a result of the interactions, thereby indicating the areas to be improved [17]. The usability test method is based on evaluating the ease of use by observing the users perform certain tasks.

1.2 Research Methods for the Usability Test of Mobile Applications

Two methods (field and laboratory experiments conducted in accordance with the targets and usability) are used in researching mobile applications, and these methods have their positive and negative aspects [18]. A field study with selected, authentic tasks was conducted to obtain results relating to the daily use of the application in real life.

1.2.1 Laboratory Experiments

Laboratory experiments in usability test environments can be easily performed, because there are few elements that can distract the participants. The participants feel comfortable, and they can be easily employed by the researcher. Factors such as noise, interference, or actions that can affect the performance of the researchers and participants are not present in these environments [19]. If the participants are aware that they are in a foreign environment and being tested, they may be negatively affected, and that may give rise to outcomes that affect the results [18].

1.2.2 Field Experiments

Field experiments are the research methods based on the experiences of the participants in authentic environments and are considered to be more reliable than experiments in the laboratory environment, yielding more realistic results. The challenge in this method is that external factors cannot be strictly controlled. If the application is created in the usual environment of the participant, the risk of distracting factors, such as noise or interference, is high. These factors were eliminated as much as possible in this study. Authentic environmental conditions were protected, and issues such as noise, light, or Internet connections that could jeopardize the validity of the study were largely controlled by the precautions taken. Spare mobile devices with Internet connection were present in case of any hardware or connection issues that might have arisen during the process. The direction followed in this study is summarized by the flow diagram in Fig. 13.3, which was put forward in [18].

As this study is related to authentic usability, it was conducted as a field study. Modern and traditional tools were used for data collection, such as think-aloud, observational, and questionnaire methods [20]. Reviewing the literature for improving applications related to health, evaluating users' comments and conducting pilot implementations and usability studies are considered important [21]. When evaluated for their usability, mobile applications' specifications, such

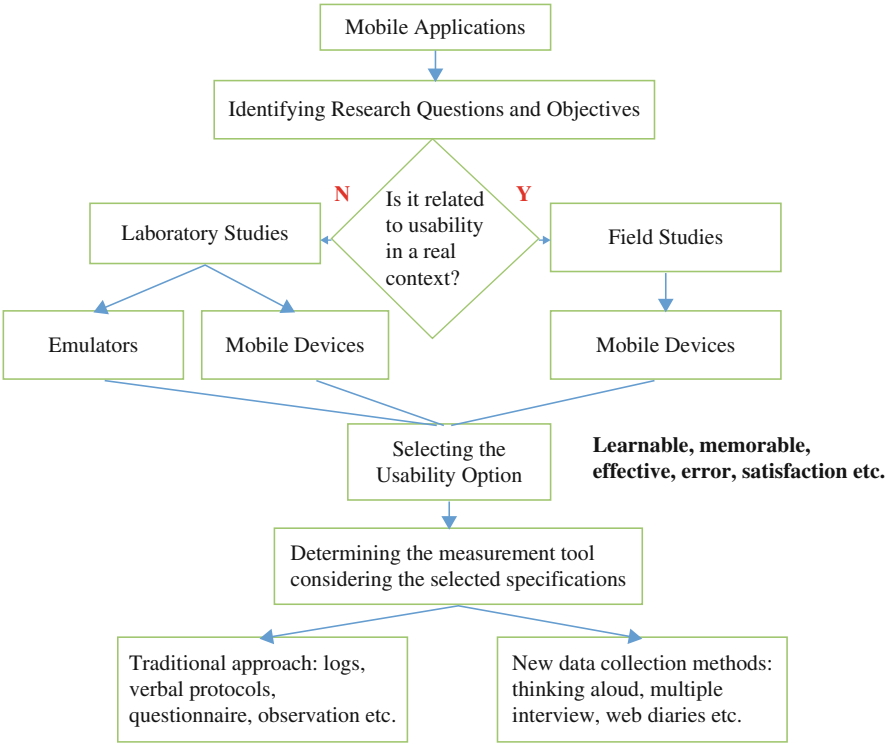

Fig. 13.3 A framework for designing and applying the usability test in mobile applications (adopted from [18])

as enabling users to integrate into the system, its functionality, its guidance, quality of information, interface specifications, and graphics quality should all be considered [22].

2 Literature Review

Even though studies related to usability are conducted in the design and development stages, they are often used for improving completed applications. Developing e-government applications need more usability studies for their improvement, validity, and reliability. Karahoca [23] researched the usability of a mobile emergency service application developed by them to access the patient records of a hospital in a fast, accurate, and efficient way on tablets [23]. Researchers were provided with feedback from nurses and doctors while they were designing the application and they completed their study in two stages. Various tasks related to certain scenarios were assigned to six nurses and four doctors. Times spent performing

these tasks were recorded. Moreover, a motivation questionnaire was developed by the researchers, which was used to support the data. As a result of the review, it was found that those who had a high motivation used the interface on a tablet PC effectively. It was also realized that buttons and font sizes should be changed as a result of the usability test.

In another study conducted by Vélez [24], the usability of an application developed to find a solution to the issue of accessing the services in rural areas of Ghana was researched. With the usability tests performed for the application, called mClinic, various goals, such as making it easier for nurse midwives to access the information and reduce the workload in reporting were set, and these goals were set in accordance with a needs analysis. The data in the usability analysis were collected through participant observation, contextual questioning, and interviewing methods. With the data, the application was evaluated with heuristic evaluation, field experiment, and usability questionnaires in the second development stage. As a result of this study, issues in selecting the hardware were detected with the heuristic evaluation. In addition, usability questionnaires indicated that nurse midwives found the application easy to use, but their self-efficacy in using the technology was low [24].

In the study conducted by Hashim [25], a questionnaire related to the usability of a mobile learning application was taken by 66 university students and 12 of them were investigated with participant observation. A significant relationship was found between the usability questionnaire's sub-sections on topics of consistency, flexibility, learnability, least action and most memory load—and participant observation. The usability test was used in this study to evaluate an application previously developed [25].

A prototype edition and usability tests conducted in both an experimental environment and on site were used for improving the myMytileneCity mobile application, an electronic tourist guide. Twenty participants taking part in the experimental environment test—conducted with emulators—were asked to perform the tasks set before them. These participants used the mobile application with authentic devices in a field test. Following these tests, participants were interviewed and their opinions were noted. Many improvement suggestions were made at the end of the tests, and participant satisfaction was found to be high [26]. The literature review indicates that applications were improved in accordance with the results and suggestions from the usability tests.

3 Method

A usability field study and mixed research design was conducted in which quantitative and qualitative data collection methods were used together. Details follow.

Table 13.1 Age and gender distributions of the participants

	18–25 years old	26–35 years old	36–45 years old	Over 45 years old	Total
Female	2	2	2	2	8
Male	2	2	2	2	8
Total	4	4	4	4	16

3.1 Participants

Participants were selected by considering age criteria, gender, and CHAS experience. Those who have used the CHAS mobile application before were not included in the study. Characteristics of the participants are shown in Table 13.1.

3.2 Data Collection Tools

To collect data for the study, notes were taken while the participants performed their tasks and thought out aloud. This was combined with observational and interview notes, questionnaire results, and evaluation forms (filled in by the researchers) displaying how the participants performed their tasks.

3.3 Data Collection Process

First, users were asked whether they had used CHAS on a mobile platform before. The purpose of the study was explained by the researchers and the participants were asked to fill in the questionnaire containing demographic information. The participants were asked to perform the selected tasks with their smartphones or any other mobile device (if available). If they did not have their smartphones, they were asked to perform them with the mobile devices provided by the researchers. The tasks the participants were asked to perform are listed in Table 13.2.

While the tasks were being performed, researchers helped the participants when needed. Task completion rates were specified by considering how the participants perform the tasks with the support from the researchers. Moreover, participants' start and finish times were recorded with completed durations measured in seconds.

4 Data Analysis and Findings

With the codes determined by the researchers, analysis of the data were completed using the SPSS 21 program for the quantitative data and using Microsoft Word

Table 13.2 Tasks participants were asked to perform in the study

Tasks
1. Download and install the Centralized Hospital Appointment System software on the mobile device
2. Log into the system
3. Make an appointment for the city, county, hospital, clinic, polyclinic, and the doctor indicated by the researchers
4. Cancel the appointment
5. Change your e-mail in the system
6. Change your password in the system

Table 13.3 Demographic variable distribution of the participant group

	Gender	Age	Educational status	Computer literacy	Experience of using touch-screen device	Experience of using CHAS
Mean	1.50	2.50	2.13	2.13	2.19	3.31
Min.	1.00	1.00	1.00	1.00	1.00	1.00
Max.	2.00	4.00	4.00	3.00	3.00	4.00

and Excel for the qualitative data derived from the participating group. Descriptive analysis, nonparametric chi-square test (single sample and two variables) and Kruskal-Wallis H Tests were used for the quantitative analysis of the data.

4.1 Quantitative Data Analysis

Descriptive statistics, nonparametric chi-square test, and Kruskal-Wallis H Tests (as the study group was lower than 30) were used for the analysis of the quantitative data in this study [27].

4.1.1 Demographic Data Analysis

In this study, demographic data were collected for the participants relating to their gender, age, educational status, computer literacy, experience of using a touch-screen device, and CHAS. The demographic variable distribution of the participant group consisting of 16 people is shown in Table 13.3.

4.1.2 Analysis of Participant Evaluation Data

How the participant group was made up in terms of the demographic data is explained in Table 13.4 with frequency and percentage values.

Table 13.4 Participant group's demographic distribution by frequency and percentage

Demographic variables		Frequency	Percentage
Gender	Female	8	50.0
	Male	8	50.0
Age	18–25 years old	4	25.0
	26–35 years old	4	25.0
	36–45 years old	4	25.0
	Over 45 years old	4	25.0
Educational status	High school	7	43.8
	Associate degree	1	6.3
	Bachelor's degree	7	43.8
	Master's degree	1	6.3
Computer literacy	Low	4	25.0
	Medium	6	37.5
	High	6	37.5
Experience of using touch-screen device	Low	3	18.8
	Medium	7	43.8
	High	6	37.5
Experience of using CHAS	I do not have a membership	2	12.5
	I have just heard/seen	2	12.5
	I have a membership but I have not used it yet	1	6.3
	I have only used ALO 182 line	11	68.8

Table 13.5 Participant groups' system evaluation

	Interface	Frequency of getting lost	Ease of use	Usability level
Mean	3.88	2.44	2.69	4.13
Minimum	2.00	1.00	1.00	2.00
Maximum	5.00	5.00	5.00	5.00

Once having collected the study data and completed the tasks, participants were asked to evaluate the CHAS interface, frequency of getting lost, ease of use, and usability levels. Evaluation data were collected as five-point Likert items. Mean, minimum, and maximum values from the participants' evaluations are presented in Table 13.5.

4.1.3 Results of the Single Sample Chi-Square Analysis

Results of the analyses and participant group's system evaluation scores (interface, frequency of getting lost, ease of use and usability level) indicated that no significant

Table 13.6 Chi-square analysis results related to the task completion degrees of the participant group

	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
Chi-square	10.88	2.38	0.88	7.50	7.63	6.13
sd	4	2	2	3	2	2
p	0.028	0.305	0.646	0.058	0.022	0.047

Table 13.7 Changes in group's rates of completing Task 2 (gender)

Group	N	Mean rank	Total rank	U	p
Female	8	5.88	47.00	11.00	0.016
Male	8	11.13	89.00		

difference was found. Considering the task completion degrees, the results of the chi-square analysis are presented in Table 13.6.

The participant group showed a significant difference within itself in terms of the score distribution of Tasks 1, 5 and 6. The significant difference in Task 1 and Task 6 indicated task completion. However, the difference in Task 5 indicates non-completion of the task. In other words, the participant group was significantly successful in downloading and installing the application, and changing their password. The group was unsuccessful in changing their e-mail in the system. The fact that the e-mail section was optional in the signing up process and that many users only provided the obligatory information are considered to be the reasons for this failure.

4.1.4 Results of Bivariate Chi-Square Analysis

The chi-square analysis of the distribution (by gender) of the participants' task scores indicated that there was a significant difference in Task 2 scores: X^2 (sd = 2, n = 16) = 7.33 ($p < 0.05$), p = 0.016. Table 13.7 shows that this difference favors the males.

According to the results of chi-square test—performed to study the relationship between CHAS experiences of the participant group and the task scores—a significant relationship was found between Task 5 completion rates and system experience. For X^2, it was found that the significant difference (sd = 6, n = 16) = 16.73 ($p < 0.05$), p = 0.010 arose from the fact that the majority of those who used ALO 182 line could not complete the task. A comparison between the user evaluation rates and task scores revealed a relationship between the interface evaluation and Task 6 scores. Users who evaluated the interface positively had higher scores in Task 6: X^2 (sd = 6, n = 16) = 13.93 (p = 0.030 < 0.05). It was also found that users who evaluated the application's ease of use negatively had higher scores in Task 5: X^2 (sd = 8, n = 16) = 16.40 (p = 0.037 < 0.05).

Table 13.8 Changes in the completion rates of Task 1 (by age)

Group	n	Mean rank	sd	X^2	p
18–25 years old	4	12.50	3	8.103	0.044
26–35 years old	4	10.00			
36–45 years old	4	7.50			
Over 45 years old	4	4.00			

Table 13.9 Changes in the completion rates of Task 5 (by age)

Group	n	Mean rank	sd	X^2	p
18–25 years old	4	11.88	3	8.795	0.032
26–35 years old	4	11.13			
36–45 years old	4	5.50			
Over 45 years old	4	5.50			

Table 13.10 Changes in the completion durations of Task 6 (by age)

Group	n	Mean rank	Sd	X^2	p
18–25 years old	4	11.25	3	8.50	0.037
26–35 years old	4	11.75			
36–45 years old	4	5.50			
Over 45 years old	4	5.50			

4.1.5 Results of Kruskal-Wallis H Test Analysis

The task performance of the demographic variables (excluding gender) and their relationship was analyzed with the Kruskal-Wallis H test. A significant relationship was found between the age variable and completion rate of the performance of Tasks 1 and 5 (completion rate and duration). Changes in the completion rates of Task 1 (by age) are presented in Table 13.8 ($p = 0.044 < 0.05$). Younger participants were found to be more successful in downloading and installing the application.

Changes in the completion rates of Task 5 (by age) are presented in Table 13.9 ($p = 0.032 < 0.05$). Younger participants were found to be more successful in changing their e-mail in the system.

Changes in the completion durations of Task 6 (by age) are presented in Table 13.10 ($p = 0.037 < 0.05$). Younger participants were found to be faster in changing their password in the system.

Mean changes in task scores (by age) were found to be at the limit of significance, favoring the younger users ($p = 0.053$). Changes (by age groups) in the mean scores obtained from all the tasks to be performed on the mobile application and the greater success of the younger age groups were some of the expected findings. A significant relationship was found between the educational status variable and the completion rates of Task 2 and Task 3. As the education level got higher, completion rates of Task 2 and Task 3 were found to get higher. Changes in the completion rates of Task 2 (by educational status variable) are presented in Table 13.11 ($p = 0.023 < 0.05$) with users becoming more successful in logging in to the system as their educational status got higher.

Table 13.11 Changes in the completion rates of Task 2 (by educational status variable)

Group	n	Mean rank	sd	X^2	p
High school	7	5.50	3	9.523	0.023
Associate degree	1	3.00			
Bachelor's degree	7	11.71			
Master's degree	1	12.50			

Table 13.12 Changes in the completion rates of Task 3 (by educational status variable)

Group	n	Mean rank	sd	X^2	p
High school	7	5.57	3	8.326	0.040
Associate degree	1	4.00			
Bachelor's degree	7	11.29			
Master's degree	1	14.00			

Table 13.13 Changes in the completion rates of Task 1 (by experience of touch-screen device use)

Group	n	Mean rank	sd	X^2	p
Low	3	3.50	2	6.861	0.032
Medium	7	8.00			
High	6	11.58			

Table 13.14 Changes in the completion rates of Task 2 (by experience of touch-screen device use variable)

Group	n	Mean rank	sd	X^2	P
Low	3	4.33	3	8.326	0.040
Medium	7	7.64			
High	6	11.58			

Changes in the completion rates of Task 3 (by educational status variable) are presented in Table 13.12 ($p = 0.040 < 0.05$). A rise in educational status also increased the rate of success in making an appointment.

Task 1 and Task 2 completion rates and the mean task scores were found to change in accordance with the experience in the use of touch-screen devices. Changes in the completion rates of Task 1 (with the experience in the use of touch-screen devices) are presented in Table 13.13 ($p = 0.032 < 0.05$). Those who have more experience of using touch-screen devices are more successful in downloading the application.

Changes in the completion rates of Task 2 (by experience of touch-screen device use *variable*) are presented in Table 13.14 ($p = 0.040 < 0.05$). Those who have more experience of using touch-screen devices are more successful in logging in to the system.

Changes in the mean task completion scores (by experience of touch-screen device use variable) are presented in Table 13.15 ($p = 0.027 < 0.05$). This result indicates that being experienced in using touch-screen devices is an effective factor for the completion rates of all tasks and a factor boosting success.

No significant difference (in terms of task completion scores) was found between computer literacy level and task performance.

Table 13.15 Changes in the mean task completion scores (by experience of touch-screen device use)

Group	n	Mean rank	sd	X^2	P
Low	3	4.33	2	7.217	0.027
Medium	7	6.93			
High	6	12.42			

Table 13.16 Analysis of the participant group's system evaluation.

Questions	Subjects	Frequency
Most beneficial specifications	Speed	7
	Being a mobile application	2
	No necessity to talk with someone	3
	No necessity to wait like in ALO 182 line	2
Least beneficial specifications	Other identification info can be obtained from e-government with the id no	7
	Asking landline number	2
Specifications that can be added to make the application more useful	Detailed info about the doctors (résumé, workload etc.)	5
	Automatically filling the location info by location detection	2
	Searching all doctors of a certain department in all hospitals	1
Improvements to the interface to make the application more satisfying	Using different and vivid colors	3
	Bigger fonts and buttons	5
	Birth date selection section should be changed	6
General suggestions and comments	It is beneficial from all aspects but only young people can use it	3
	Deficiencies in directing the user	5
	Crashing issues in certain sections (especially in selecting the county) should be solved	5

4.2 Qualitative Data Analysis

The observational, interview-based, and think-aloud notes collected qualitatively were analyzed using Microsoft Word and Excel in accordance with the codes specified by the researchers [28]. The participant group was asked to answer open-ended questions and evaluate the system. Evaluations were categorized in accordance with the subject titles in Table 13.16 and the frequency of subjects mentioned.

In the data collection stage of the study, participants were asked to think aloud while performing their tasks and participants were observed by the researchers. According to the observation and think-aloud notes and analysis results, the issues

Table 13.17 Analysis of think-aloud and observational notes

Issues	Frequency	Details
Connection issue	4	
Touch-screen issue	3	
Getting lost	8	Guidance deficiencies (5)
Unnecessary specifications	15	Landline (5)
		e-mail (6)
Specifications that should be added	5	Other identification to be obtained from e-gov with id no (2)
		Detailed info about the doctors (2)
		Warning about how many characters a password must have (1)
Usability (+)	1	Listing the hospitals
Usability (−)	39	Crashing issues in county selection section
		Entering the date of birth (10)
Ease of use/understanding (+)	2	Selection in accordance with the appropriate criteria
Ease of use/understanding (−)	33	Appointment cancellation (8)
		Downloading mobile application (7)
		Guidance deficiencies (5)
Interface (+)	2	
Interface (−)	12	Entering the date of birth (6)
		Appointment cancellation (5)

in Table 13.17 were found to be mentioned frequently. Issues presented in the table were selected in accordance with the general observations of the researchers and the + and − symbols were used to indicate the positive and negative statements. The frequency of mentioning the issue details was presented in the details section in the parenthesis.

5 Results

The usability of the CHAS mobile application developed by the Turkish Ministry of Health was tested by the participants in specific gender and age groups. Issues were detected in the application interface and its operation when critical tasks were performed, and suggestions to improve the usability of the application were provided by the participants.

Findings indicated that the majority of the participants used the ALO 182 appointment service. The results of the visual interface evaluation indicated that the majority of the participants were satisfied with the application. While using the application and examining the frequency of getting lost, it was found that partic-

ipants had getting lost issues occasionally. It was concluded that the participants rated the system's ease of use as medium-level. In terms of usability, the majority of the participants stated that they found the CHAS mobile application easy to use.

Findings proved that the participants who got high scores in evaluating the interface also had high scores in changing the password. Participants whose educational statuses were high did not have any difficulties in logging in and making an appointment. It was found that users who had previous experience of touch-screen devices used the application easily and their rates of completing the tasks were high.

Task completion rates for the male participants were found to be higher than those of the female participants. Results of this study correspond to similar studies in this field. In the usability study of Sonderegger and Sauer [29], females had slightly more difficulties than males in completing the tasks and higher mistake rates [29]. The difference in inclination (to use technology) between the females and males favors the male participants, which is in line with the findings of Venkatesh and Morris [30]. In terms of the age groups, younger participants had higher rates of completing the tasks. Results related to the gender and age group variables correspond to the general inclination of the field.

Younger users demonstrated better performance in the web usability test [31]. The fact that younger participants had higher figures in task completion rates is thought to result from their exposure to technology at an early age, as stated by Morris and Venkatesh [32]. One of the interesting results of the study is that the participants' computer literacy level did not affect their task performance, contrary to similar studies [11] in which the participants who had higher computer literacy completed the tasks in a shorter time period.

6 Suggestions and Recommendations

Improvements made by considering the suggestions provided by participants will help users access the healthcare services easily. Following the improvements, new usability studies may be conducted using different methods with bigger participant groups.

Participants stated that they found it helpful using CHAS via a mobile application. However, they indicated that it was unnecessary for the system to ask too much personal information. Some participants stated that certain personal data could be obtained from the e-government system. Moreover, some participants emphasized that detailed information about the doctors should be added to make the application more efficient.

Automatic location entry using location detection technology is among the suggestions made by participants. Sections that challenged the participants most were signing up, putting in the date of birth, date of appointment, and appointment cancellation. Some participants had to log in a couple of times in this section.

Some participants stated that the application has deficiencies in guiding the users. Suggestions have been made for the signing up and information entry sections in general.

The fact that the application fails and displays a white screen without responding to the participant interactions in the county selection section highlights the necessity to improve its performance. Some users thought vivid colors should be used in the application. Bigger and clearer buttons for critical operations, such as appointment cancellation that directly affect interaction, and fonts, are among the primary suggestions of the participants. The CHAS mobile application is regarded as a helpful and necessary application for accessing healthcare services and it is thought the suggested improvements will make the application easier to use.

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