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Usability testing of a 3D touch screen kiosk system for way-finding

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ABSTRACT

This study aimed to determine the usability of a 3D touch screen kiosk system for way-finding at a shopping mall in Ankara, Turkey. The usability testing was conducted in collaboration with 15 authentic users and the usability problems were determined by giving authentic tasks to them. The data were collected using a usability testing form. The participants were given six authentic tasks and asked to complete them using the kiosk. The data were analyzed using descriptive statistical methods, content analysis, and the Mann-Whitney U Test. The tasks were completed with a high rate of success. There was no significant difference between the task durations of male and female participants. The main findings of the study show that prior experience using the kiosk and giving guidance during usage reduces the duration of the tasks, that there are certain problems with the touch screen and its 3D properties, participants' transfer of the types of interaction with which they are familiar to the kiosk experience leads them to make mistakes, and there are some usability problems related to the interface and content design. The results of this study and its suggestions about information and interface design can be used to design more usable kiosks.

1. Introduction

User-friendly, natural, and intuitive information systems are a requirement of the current age of information, and kiosks are among these rapidly developing information systems. A kiosk is a system made up of a computer and a touch screen. Usually no mouse or keyboard is included, and the computer is stored in a box to avoid harm and for aesthetic reasons. Kiosks are having their areas of use expanded every day. Kiosks that are enriched with technology are used by individuals from various backgrounds regardless of socio-economic status and education because of their simplified interface (Joshi, Puricelli, & Arora, 2013). Public kiosk systems are in service for many purposes such as taking photographs, connecting to the Internet, purchasing tickets, financial and administrative services, and way-finding. Kiosks are enriched with audio features, pictures, videos, and animations all of which make them interactive, user-friendly, and fun (Lim & Usma, 1998). Kiosks used to be only text-based, but new graphic-based applications, touch screens, and proximity sensors have been more common recently (Kules, Kang, Plaisant, Rose, & Shneiderman, 2004). These kinds of kiosks have also been put into use in subway stations, museums, hospitals, universities, shopping malls, and other public spaces. With the widespread use of kiosks, usability and evaluation studies in the area of user interface design have focused on this subject (Shneiderman & Plaisant, 2004). Davids, Chikte, Grimmer-Somers, and Halperin (2014) stated that usability tests should include the study of objective measures obtained by observing the interaction of users with the system being tested. User performance in usability tests is often evaluated by using accuracy and timing measures. The accuracy may be evaluated by measuring the number of successfully completed tasks and the timing may be evaluated by measuring the time to complete a task (Chen, Savage, Chourasia, Wiegmann, & Sesto, 2013). James (2014) emphasized that a kiosk's usability will have a positive effect on users' emotional state and level of satisfaction with the kiosk.

This study aimed to determine the usability of a 3D touch screen kiosk system, which is found in one of the shopping malls in Ankara, Turkey, and is used for way-finding. Haptic technology has rapidly become essential for participation in social, personal, and occupational activities. This technology is frequently found in public settings and commonly used in kiosks (Chen et al. 2013). The 3D affordance can provide a variety of advantages and disadvantages for a system. As an example, Tüzün and Özdinç (2016) examined the usefulness of a 3D multi-user virtual environment for freshmen orientation purposes and found positive influence on

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students' conceptual and spatial learning. Further, it was indicated that 3D virtual environments allow users to navigate in that environment effectively (Burigat & Chittaro, 2016). This study tests the usability of a system that is both touch screen and gives instructions using 3D visuals. In this age kiosks are widely embedded in the environment in the framework of ubiquitous computing paradigm, and the results of the research and recommendations on interface and information design can be used for the design of more usable kiosks.

2. Literature review

Chebat, Gelinas-Chebat, and Therrien (2005) stressed that there was a decrease in the number of shopping mall clients despite low prices and sales, and one of the important reasons for this was clients' having problems in finding their ways, which led them to lose time. Many disciplines, mainly psychology, continue their studies of individuals' behavior when they are trying to find their way and how they navigate (Devlin & Bernstein, 1997; Wright et al., 2010). Way-finding is a person's identification of the correct route to follow from their current location and recognizing when they reach their destination, determining a route from their starting point to their finishing point and following that route (Golledge, 1999; Peponis, Zimring, & Choi, 1990). For potential clients, it may be a challenging task to find their ways in a shopping mall. A touch screen kiosk system can help to deal with this difficulty; however, it can also cause different problems for users if there are problems in its design. This highlights the importance of conducting and evaluating usability testing for these kiosks.

Usability is a user's being able to do whatever they want to do with a product rapidly and easily (Dumas & Redis, 1999). For a certain product or system to be usable, it is supposed to be useful, efficient, effective, satisfying, learnable, and accessible (Rubin & Chisnell, 2008). The International Standards Organization (ISO) describes usability as a specific group of users' doing specific tasks in an effective and productive way and being satisfied with it (Çağıltay, 2011). There are three different usability testing methods in the relevant literature: inquiry, inspection, and usability testing. Usability testing involves authentic users and tasks. The users are observed while they are trying to complete their tasks, and usability problems in the system are determined by users' interaction with it (Battleson, Booth, & Weintrop, 2001).

There are many studies on the usability of public kiosks systems, the findings of which indicate that users mainly found these systems to be practical, fun, and smart (Kim et al., 2007). On the other hand, there are few studies focusing on the kiosk systems used for way-finding. Researchers have mainly studied the effects of navigating kiosk systems (Ali & Moulin, 2006; Devlin & Bernstein, 1997; Ross, Lightman, & Henderson, 2005; Soh & Smith-Jackson, 2004; Wright et al., 2010). One of the most significant studies on kiosks used for way-finding is the usability testing of an information kiosk system called MIKI, which has a multi-dimensional interface (Kim et al., 2007). This kiosk is located at the entrance of an institute in Memphis University. It provides information about people, offices, and research centers through an agent on a touch screen. The researchers gave three tasks to the participants about finding a person, a place, or an event to examine the usability of the system. Although it was shown that the kiosk's interface design and the quality of its graphics and content organization were adequate, the specific characteristics of individuals such as gender and experience influenced their use of the system. This research study also investigated the influence of gender and prior experience to verify this finding.

3. Method

The authors used a usability test to examine a 3D touch screen kiosk that is used for way-finding purposes. The authors conducted usability tests with authentic users and determined the usability problems in the system by giving authentic tasks to them.

3.1. The kiosk system

This study's kiosk system is called “i-Showcase” (Fig. 1). It is located in a shopping mall in Ankara, Turkey and designed to help visitors to find their way. It includes a 27-inch widescreen touch screen monitor, and users are provided with three options to find their way using the kiosk: shortcut menu, category menu, and search menu (Fig. 2). The shortcut menu gives information about finding the way to public places (the parking area, restrooms, the baby-care room, the prayer room, ATMs, and pharmacy). In the category menu, the shops in the shopping mall are categorized, and each category is displayed as an icon along with a textual label underneath. The third method of way-finding is the search menu, where users insert a search text and the shops matching that text are shown on the left of the screen (Fig. 3). When a location is found by using one of these three methods, instructions using 3D realistic panoramic visuals to reach that location are provided.

3.2. The participants

The participants of the study consisted of 15 authentic users who were clients present at the mall during the research. They participated in the study on a voluntary basis. The guideline created by Nielsen and Landauer (1993) was used to determine the number of users. According to this guideline, 15 users are sufficient to determine most of the usability problems in a system. The ages of users varied between 12 and 52. Of them, 9 were males, 6 were

Fig. 1. The i-Showcase kiosk system.

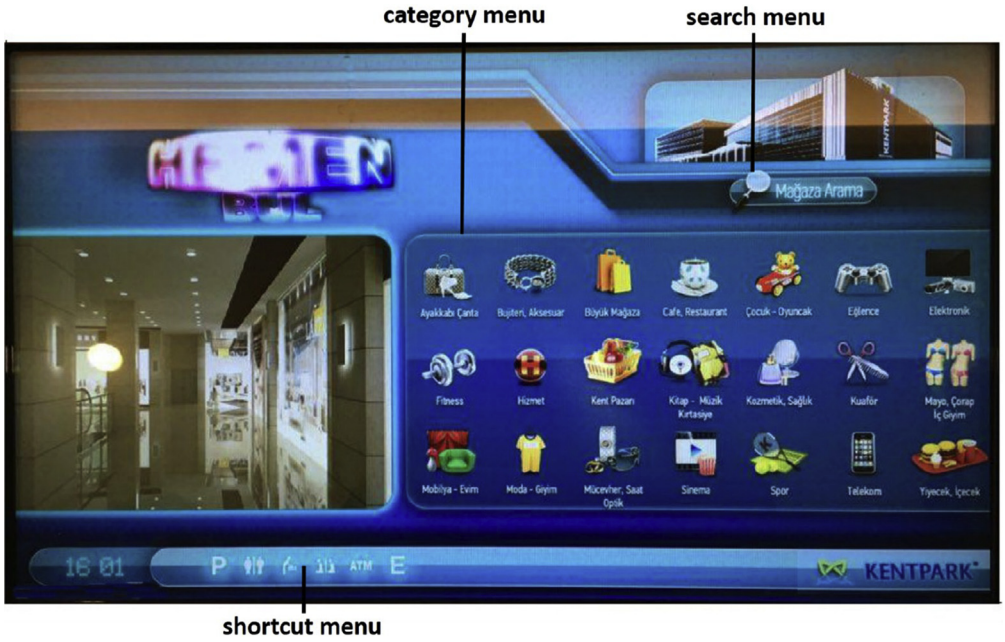

Fig. 2. User interface of the i-Showcase kiosk system.

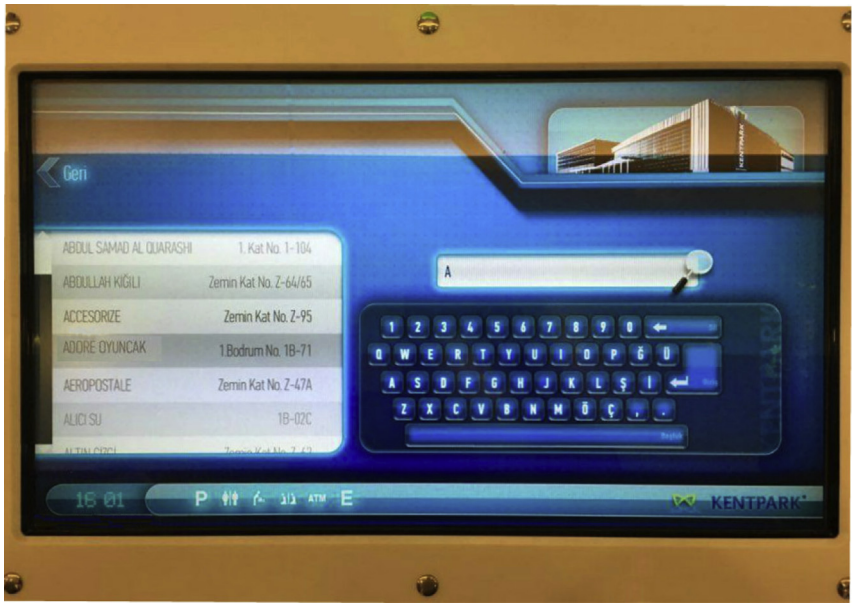

Fig. 3. Search menu.

females, 8 were students, 6 were employed and 1 was a housewife. Nine of the participants had experience using a kiosk, and 6 did not.

3.3. Data collection

The data were collected using a usability evaluation form that was created by the authors and consisted of four sections. The first section included questions about demographics. The second section included a table to record the data related to the tasks given to the participants, and the third section included six 5-point Likert type questions and 3 open-ended questions aimed to determine the satisfaction levels of the participants. The researchers added another section to the evaluation form that included their observation notes in addition to participants' statements about problems using the system. The initial version of the form was presented to an expert in the field of human-computer interaction to verify its validity in terms of whether the data collected are relevant to a reasonable evaluation of the kiosk. Then the form was revised according to the expert's feedback and rechecked by the expert.

3.4. Tasks

The authors examined the kiosk before determining the tasks to be assigned to the participants in the usability test. Since the kiosk was designed for way-finding, the authors found out the methods

that could be used for way-finding tasks and found that they could be managed by using three different methods. Then they created six tasks based on these three methods. Table 1 shows the tasks in the order that they were completed. The second and sixth tasks were aimed at finding out the method that participants chose to find their way. The other tasks aimed at finding out how the specific methods were used to realize the way-finding task.

3.5. Procedures

There are 9 kiosks in the 4-floor shopping mall where the study was conducted. The required consent was obtained from the administration of the mall prior to the implementation. However, the administration allowed only one kiosk to be used, and a kiosk located near a crowded gate was chosen. During the implementation, one researcher stayed in contact with the participants, oriented them for the tasks and filled in the data form, while another researcher recorded the time data, and a third took notes based on observation. A pilot test was conducted with three participants to determine any problems with the tasks, and those data were not included in the study. The tasks were reviewed after the pilot test, and the necessary modifications were made. The participants were informed about the aim of the study during the implementation, and the issues they were supposed to consider were explained. They were also informed that their personal data would be kept confidential and thanked for their contributions. Then, their demographical data were obtained, and tasks were given. The researchers did not intervene for the duration of the participants' tasks. They passed on to their next task after completing one task or stating that they were unable to complete it. After the tasks were completed, the researchers read the questions on the form and recorded their responses.

3.6. Data analysis

The data were analyzed using descriptive statistics such as percentages, frequencies, and averages. The authors conducted a content analysis of the participants' responses to open-ended questions and their own observation notes. The Mann-Whitney U test was followed to determine any differences in task durations regarding kiosk experience and gender.

4. Results

Table 2 shows participants' task achievements and durations in seconds, and the average time spent for each task. A plus sign in the table indicates a successful completion of a task, and a minus sign indicates an incomplete task.

The 15 participants undertook 90 tasks in total, 84 (93%) of which were successful. An analysis of their achievement of the tasks by gender shows that 94% of tasks (51 out of 54 tasks) were successfully completed by males and 92% of tasks (33 out of 36 tasks) were successfully completed by females. The average time spent to find a specific place in the mall was around 13 s. An analysis of the 6 incomplete tasks revealed that participants spent around 25 s on average before giving up on a task. Only one participant failed in the way-finding task that required using the category menu (Task 3), while 5 participants failed in the task on determining whether a specific store was located in the mall (Task 6). It was found that the participants failing at Task 6 did not know the type of the store in this task. No participants failed at more than one task.

An analysis of the descriptive information about the tasks (Table 3) revealed that the participants spent the most time on Task 1 (19.85 s), and they spent the shortest time on Task 5 (2.95 s). Participant 15 was the fastest to complete the tasks (45.9 s in total; 7.65 s on average). This participant was a 12 year-old primary school student and completed all the tasks successfully. Participant 7 was the slowest to complete the tasks (144 s in total; 24 s on average). This participant was 48 years of age, had an undergraduate degree, and completed all the tasks successfully.

The second and sixth tasks ($15 \times 2 = 30$ tasks) could be completed by choosing one of two different methods, and the participants chose to complete 25 tasks (83%) using the category menu and 5 tasks (17%) using the search menu. Of these 30 tasks, 5 ended in failure, and participants tried to complete 4 of them using the category menu and one using the search menu.

The authors followed Mann-Whitney U test to determine any differences between users' task durations considering their experience with using kiosk systems (Table 4). The test results revealed that there were significant differences between the Task 1 durations of users with kiosk experience and those without. Users with kiosk experience ($Md = 9.9$, $n = 9$) completed Task 1 in a shorter period of time than those without such experience ($Md = 23.05$, $n = 6$) ($U = 9.00$, $z = -2.121$, $p = 0.034$, $r = 0.55$).

Another Mann-Whitney U test was followed to find differences between users' task durations by gender (Table 5). The test results indicated no statistically significant differences between the participants' task durations by gender.

Of the six items on the interview form about users' satisfaction, the item with the highest average score was the one indicating that the kiosk content was realistic enough ($X = 4.33$), and the item with the lowest score was the one indicating that the placement of the menus in the system was appropriate ($X = 3.72$). The average of the "I was able to use the system without any difficulties" item was 4.28, and that of "The system helped me in finding the location I was trying to find" was 4.22. The average scores for "The 3D aspect of the system helped me to visualize the place I was trying to find" and "The touch screen feature of the system did not cause any problems" were 3.94.

In response to the features they liked, approximately one-third of the participants reported that their favorite feature of the system was its instructions in 3D realistic panoramic visuals ($n = 6$). Some participants reported they liked the touch screen feature of the system ($n = 3$). Another favorite feature of the participants was the classification of shops in the mall into categories ($n = 3$). Other favorite features of the users included its search engine ($n = 2$), its large screen ($n = 1$), and its navigation features ($n = 1$).

In response to the features they did not like, one-third of the users reported that they did not like the touch screen ($n = 5$). Two

Table 1
The tasks assigned to the participants.

Task 1	Find the way to the restroom.
Task 2	Find the way to the Arkadas Bookstore.
Task 3	(By using the category menu) Find the way to the Kayseri Mutfagi restaurant.
Task 4	(By using the search menu) Find the way to the Decathlon store.
Task 5	(By using the shortcut menu) Find the way to the ATMs.
Task 6	Find out if there is a D&R store in this shopping mall.

Table 2
Participants' task achievements and durations.

Participants	Task 1 Deed & duration (s)	Task 2 Deed & duration (s)	Task 3 Deed & duration (s)	Task 4 Deed & duration (s)	Task 5 Deed & duration (s)	Task 6 Deed & duration (s)	Average time (s)
P 1	+22.3	+11	+12.3	+5.6	+2.3	+12.7	11.03
P 2	+12.1	+6.8	−16.7	+5.9	+3	+12.3	9.47
P 3	+6.4	+14	+19	+7.2	+2.4	−39.6	14.77
P 4	+11.8	+17.4	+41	+2.3	+4.1	−14.9	15.25
P 5	+51.4	+11.2	+8.4	+5.3	+2.6	−14.5	15.57
P 6	+23.8	+12.8	+11.4	+9.5	+3.2	−21.8	13.75
P 7	+46.7	+32	+31.6	+10	+4.5	+19.2	24.00
P 8	+9.9	+10.4	+16.3	+4.1	+3.2	+38.6	13.75
P 9	+22.6	+2.8	+11.5	+3.6	+3.4	−41.6	14.25
P 10	+7.2	+7.8	+19	+8	+1.6	+13.2	9.47
P 11	+7.7	+27.4	+6.4	+7.9	+6.4	+24	13.30
P 12	+19	+33.8	+5.8	+6.4	+1.7	+3.9	11.77
P 13	+21.7	+15.5	+14.2	+3.6	+2.3	+6.3	10.60
P 14	+5.5	+4.9	+7.8	+13.5	+1.6	+16.4	8.28
P 15	+29.6	+2.6	+3.8	+4.2	+2	+3.7	7.65
Average Time (s)	19.85	14.03	15.01	6.47	2.95	18.85	12.86

Table 3
Descriptive information about the tasks.

Task	Range (s)	Min. (s)	Max. (s)	Average (s)	Standard deviation
1	45.9	5.5	51.4	19.85	14.05
2	31.2	2.6	33.8	14.03	9.89
3	37.2	3.8	41	15.01	10
4	11.2	2.3	13.5	6.47	2.96
5	4.8	1.6	6.4	2.95	1.29
6	37.9	3.7	41.6	18.85	12.36

Table 4
Mann-Whitney U test results of task durations by kiosk experience.

Test statistics	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
Mann–Whitney U	9.00	18.00	25.00	24.00	25.00	18.00
Wilcoxon W	54.00	63.00	46.00	69.00	70.00	39.00
Z	−2.121	−1.061	−.236	−.354	−.236	−1.061
Asymp. Sig. (2-tailed)	.034	.289	.814	.723	.813	.289

Table 5
Mann-Whitney U test results of task durations by gender.

Test statistics	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
Mann–Whitney U	20.00	24.00	12.50	26.50	25.50	16.00
Wilcoxon W	41.00	69.00	33.50	47.50	46.50	61.00
Z	−.825	−.354	−1.710	−.059	−.177	−1.296
Asymp. Sig. (2-tailed)	.409	.724	.087	.953	.859	.195

participants indicated that the reason for their dissatisfaction was due to their not being used to touch screens. Other participants added they had problems using the touch screen. They thought that, similar to the "swipe" gesture on tablets or mobile phones, they could scroll up and down the results appearing on the left after entering a term in the search menu (Fig. 3); however, the kiosk was not capable of this. The system allows for up and down scrolling of the list by using the arrows showing up and down on the left of the list. Most participants made mistakes while using these arrows, and they expressed negative opinions about this navigation feature. Participants also indicated they had problems with the features of the pop-up keyboard in the search menu (n = 4). In this menu, most users pressed Enter or the magnifier icon after entering text with the pop-up keyboard. However, neither the Enter key nor the magnifier icon was functional. The system only allows users to select from the list that appears on the left after inserting data using the pop-up keyboard. In addition, special characters in some stores' names, such as the ampersand (&), do not exist on the keyboard. Another feature participants had difficulty finding, and therefore disliked, was the obscure location of the back button used for returning to the main screen (n = 3). In response to open-ended questions, the users expressed dislike for some other features: the system gave a short description of the searched location (n = 2), the shortcut menu did not have suitably positioned icons (n = 2), the screen was disorganized (n = 2), there were no updates about the mall's newly opened stores (n = 1), and the screen of the kiosk was very large (n = 1).

In response to the features that should be improved, the users suggested that the pop-up keyboard should be improved (n = 3). Two participants stressed that the system should have been accessible for the visually impaired and therefore, it should have had an audio feature. The users suggested that some other features of the system should be improved: a regular keyboard should be added to the system (n = 1), the locations of the stores should be given floor by floor (n = 1), the system should be updated (n = 1), more kiosks should be set up in the mall (n = 1), and the shortcut menu should be moved to the top of the screen (n = 1).

5. Discussion

This study investigated the usability of a kiosk system used for way-finding in a shopping mall. The success rate in completing the tasks was high, and there was no statistically significant difference between the task durations of male and female participants. Since touch screen kiosks are directly controlled by users' fingers and are easy to use for most people (Wang, 2014), this finding may not be surprising. Considering that the average time spent to find a specific place in the mall in this research is short and around 13 s, it can be put forward that kiosk systems used for way-finding solves the way-finding problems in shopping malls identified by Chebat et al. (2005). Participants tended to give up on a way-finding task when the time spent doubled the average. Due to the dynamics of malls, the status of newly opened or closed stores should be updated in kiosks. The lack of updating was one of the aspects of this kiosk system that users complained about. If these systems are provided with an Internet connection, the content of kiosks in a specific mall can be frequently updated remotely.

The participants spent the most amount of time on the first task while they spent the least amount of time on the fifth. Both of these similar tasks can only be completed using the shortcut menu. The

main difference between the performances of these tasks was that clients were not familiar with the kiosk and they were not given any guidance for doing the first task. On the other hand, they had become familiar with the system by the time they began the fifth task and were also provided guidance about the shortcut menu. Having experience and being given guidance enabled the users to complete this task more quickly. Another remarkable point is that the range of durations spent on the tasks is high. This may have resulted from the fact that the sample included both participants with kiosk experience and those without it. Accordingly, the clients who were experienced in using a kiosk completed the first task in a significantly shorter time than those who were not. Maguire (1999) stressed that kiosks should be designed to satisfy the needs of users with different characteristics and levels of experience. To solve problems related to the lack of experience and reduce mistakes, a help menu can be added to the system. Additionally, Ali and Moulin (2006) indicated that agents with artificial intelligence adapted to the knowledge-based kiosk systems might also increase their usability.

One of the most important results attained from this study is that the participant who completed the tasks in the shortest time was a 12 year-old. This finding supports the fact that previous experiences played a major role in users' success in tasks. In the present day, children are described as a generation that are capable of using technological devices (e.g., computers, mobile phones, music players, and video cameras) effectively (Prensky, 2001) and use technology to discover, express, and change ideas (Kolikant, 2010). According to McKnight and Cassidy (2012), the interactions between children and touch screen devices are very common and many parents use touch screen products as tools for their children's learning and entertainment. For this reason, this outcome is not surprising. However, it is a surprising result that the second fastest participant was a 52 year-old housewife. This participant indicated that she made use of technology all the time and had a tablet that she used frequently, which confirms that prior experience is a variable that influences task duration.

It was found that participants preferred to use the category menu for tasks that could be accomplished using multiple methods. A specific issue that was not expressed by the participants yet observed by the researchers was that the stores were classified under only one category. For instance, while there is a “Fashion & Clothing” category on the category menu, big fashion and dressing stores are included only in the “Big Stores” category. Due to the category menu's frequent use, its design should be given importance, and stores should be placed under multiple categories when necessary. If, as the user-centered design paradigm dictates, potential users are consulted to determine the names of categories and to select the stores to be included in them, these problems can be resolved. Higher incompletion rate of the sixth task provides further evidence to the importance of the category menu. It was found that the participants failing at this task were not familiar with the category the store in this task belonged to.

Their responses to the satisfaction survey indicate that the clients found the system easy to use, that it helped them to find their ways, and that the environment was authentic. Presumably, the realistic panoramic visuals played an important role in users' perceiving the environment as authentic. On the other hand, the item indicating that the system's 3D feature helped them to visualize the place they were seeking is one of the lowest-scored items. The authors believe that difficulties perceiving the 3D environment influenced this result. The 3D feature sometimes makes it difficult for the users to use the system. McCauley, D'Mello, Kim, and Polkosky (2008) conducted usability test of a kiosk system that provided 3D floor plans for a building. The users indicated that they found those plans impractical, and they could not set the speed of the system. The loss of time and usability problems resulting from the 3D feature can be eliminated by giving orientations to the system and presenting the general structure of the system in 3D. The problems resulting from users' levels of perceiving the 3D feature can be removed by giving them the option to set the speed of the 3D instruction describing how to go to that place after it was found in the system. There is a need for further comparative studies since there are no findings that demonstrate whether a 2D system or a 3D system provides better understanding. Accordingly, Elvins, Nadeau, Schul, and Kirsh (2001) suggested that giving instructions about way-finding in authentic or virtual environments is very important, yet there are no comparative studies asserting the difference between 2D and 3D instructions.

Participants made errors by trying to use the touch screen of the kiosk by swiping their fingers up and down the way they are accustomed to doing on their mobile phones. According to Dix, Finlay, Abowd, and Beale (2004), when individuals encounter a new system, they try to use that system by using it the way they use familiar systems. Thus, participants' transferring their mobile phone touch screen experiences to the kiosk system leads them to make mistakes as Norman (1990) suggests in his “gulf of execution” model. Touch screen usage was also observed to be problematic for the middle aged and older participants. The satisfaction survey indicates that the item about the use of the touch screen has a lower score than most other items. Lamel, Bennacef, Gauvain, Dartigues, and Temem (2002) indicated that kiosks with a touch screen are found to be more effective by users in terms of their speed and ease of use; however, they stressed that it is important to enable users to choose a mode suitable for them. If the system is improved in the way users are familiar with in their mobile phones and a regular keyboard along with audio function is added for those who are not used to touch screens, the problems related to the touch screen can be eliminated.

When further issues related to interaction are considered, the users had problems returning to the home page. It was suggested that the shortcut menu should be relocated to the upper part of the screen. There were problems with the search menu since there was no Enter key on the pop-up keyboard and no special characters such as the ampersand (&). If this pop-up keyboard is made more functional by including special characters and activating the magnifier icon as the search key, it will prevent users from wasting time. Some participants had positive opinions about the size of the screen, while some others had negative opinions. Colle and Hiszem (2004) reported that there were no standards for the size of the screens of kiosks and their on-screen icons, and that further studies are required to determine criteria for sizing them. It is therefore necessary to conduct studies to determine guidelines for the placement of the screen and its icons.

6. Conclusion and future work

The authors determined the usability problems in this way-finding kiosk system and made suggestions to enhance the system by eliminating them. However, in this study, the tasks were completed when the participants found the place they were looking for on the kiosk. It was not within the scope of this study to determine whether the participants could actually reach the places they found on the kiosk since this was beyond the limits of the consent obtained from the administration of the mall. If future usability testing studies of similar kiosk systems include the real world performances of the participants, the efficiency of these performance support systems will be revealed. Yeniad, Mazman, Tüzün, and Akbal (2011) stressed that testing usability with different tools provides diversity in diagnosing design problems. Eye-tracking technique has been particularly successful in the

usability evaluation of human-computer interface design (Chen & Lim, 2013). This method is especially a useful method providing quantitative and objective data and this method should become widespread. As a recent trend, mobile eye-tracking technology can be used for the evaluation of kiosks. Another important recommendation is about people with disabilities. Menzi-Çetin, Alemdağ, Tüzün, and Yıldız (in press) emphasized the importance of usability of public systems for a variety of groups such as the elderly, youths, students, or people with mental or physical disabilities. Usability testing of kiosks in future studies need to include people with disabilities to verify these kiosks also serve the needs of them.

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