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Survey of the Smartphones Usability Score and the Level of Satisfaction among Elderly Users

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ABSTRACT

Smartphones are one of the latest technologies which have a profound impact on users' daily life. This technology was adapted to meet the expectations of users in different age's groups, but elderly users may encounter some difficulty while using these devices. The current study was aimed to evaluate the usability of smartphones for elderly users, and assess their level of satisfaction with these devices. The number of 30 elderly subjects with previous experience of using a smartphone were invited to take part in the study. Participants were asked to unlock the phone, enter their contact list and call a specific person, add a new number to their contact list and save it, compose a text message and send it, set an alarm, and locate the nearest bank with the help of a smartphone map application. Demographic questionnaires and System Usability Scale (SUS) were filled out by the subjects and a Visual Analog Scale (VAS) was used to assess user's satisfaction. The average time spent on completing different tasks, namely unlocking, finding a specific contact, adding a new number, texting, setting an alarm, and using a map were: 45.6, 79.4, 119.5, 113.5, 54, and 48 seconds ,respectively. The mean score for SUS and satisfaction were 59.13 and 62.5, respectively, which were acceptable for these two factors. Age is an important factor in the usability of this technology, with older people stating lower levels of usability. Since the results of the study showed that smartphones need to become more usable for this group of users, it can be said that age of consumers is an important factor that should be taken into account when designing new technologies.

KEYWORDS: *Usability, Aging, Smartphone, performance*

INTRODUCTION

Due to the increasing role that new technologies-especially smartphones-play in daily life, most people find themselves in a situation in which they need to work with a smartphone at some point in life [1]. Most consumers use trial and error when learning how to use their device, but elderly users sometimes have difficulty when using their devices. Additionally, the elderly are hindered by a decline in their physical and cognitive performance, flexibility, and grasping power [2-5]. Considering the growing

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number of elderly in the population, the need for an appropriate product for this population group was remain. Besides, teaching the elderly how to complete tasks themselves and become more independent, and also helping them to remain socially active are two important factors which demonstrate the necessity of designing a smartphone for elderly users [4-6-7].

Therefore, issues such as fear, anxiety, and limited knowledge of technology, discourage them and prevent the elderly to apply new technologies and devices [8-9]. Furthermore, Sonderegger in a study found that the elderly users based on their habits are less inclined to learn and use new technologies [10].

Elderly users presented weak performance, slow reaction time, and poor visual scanning compared to younger users. Typing speed was lower among elderly users compared to adult and children groups. Additionally, it has been reported that elderly users make more mistakes and have lower effectiveness when using smartphones than their younger counterparts. Interestingly, font size is another important factor; whenever font size is zoom in, the average time taken to complete the tasks decreased, however, it is still take more time by younger smartphone users [2-10-12].

The results of different studies showed that the elderly people use smartphones for just a few specific tasks such as call and text a message (in urgent cases) [13-14]. This group of users claimed that the smartphones have certain problems which limit their usability [13].

Regarding the elderly population ascending trend, the necessity to design compatible devices for these groups increasingly required. Even some physical features of smartphones needed to be adjusted for elderly consumers. The elderly users' weak-eyesight unable them to perform even the simplest actions, such as answering phone calls. Accordingly, they need phones with larger touchscreens, buttons, and font [12-13-15].

Some other factors challenge the usability of the smartphones for these group including multi-pages menu, functions that require multiple steps for completion, and icons instead of textual labels [15].

Product usability concept defined as a way to recognize contradictory features or the quality of new technologies. The term "user-friendly" which has been replaced by usability, wants to determine a product users' satisfaction to increase the product efficiency and effectiveness [16-17]. A product usability feature's design based on ISO 9241-11 increases the device's effectiveness, efficiency, and satisfaction [18-19]. The usability assessment methods applicable for 5 to 10 subjects and the obtained results are valuable [20]. These methods can help detecting masked design flaws and improving the operation [19].

The present study was aimed to investigate the usability of smartphones for elderly users.

METHOD AND MATERIALS

In the first step, face to face conversations with more than 100 elderly smartphone users was conducted to determine the most used smartphones among elderly users. The results showed that Samsung and Huawei were the most two popular brands while Sony brand had no users so far. In this research, a semi-experimental study was conducted to determine the usability and satisfaction of smartphone among elderly. The elderly users were selected among students in three main cultural centers in Tehran. The inclusion criteria were (i) having good general health with ability to grip the smartphone, (ii) having no interruptive musculoskeletal disorders, (iii) having ability to live alone and daily life activities self-sufficiency. Furthermore, in this study, participants with diplopia, color blindness, previous psychological disease were excluded. Based on inclusion criteria, 61 elderly were invited to this study. Sixteen of them refused to participate due to fear of working with a new smartphone in front of their friends, seven persons mentioned that they cannot read the screen appropriately without their glasses (even though the size of words and numbers were enlarged up to the highest level in the Android system), and 8 people stated that they are in a hurry and can't stay. All the invited people to this study were able to read words on the screen without glasses.

Finally, 30 participants (12 males and 18 females), aged over 60 years with previous experience of using smartphones for more than 1 year were selected to take part in this study. All the invited participants had previous experience of using smartphones. In this study, a specific smartphone model (Sony Xperia M5, 5 inches touchscreen wide, 142.5 gr) were selected because it was the only smartphone which every participant previously worked with this smartphone. Other brands such as

iPhone, Samsung, HTC, and Huawei were excluded due to possible negative impact on the accuracy of this study. The study was conducted in a quiet room to limit distractive factors, and the participants were asked to turn off their own cellphones for greater concentration.

In order to omit the necessity of using glasses the largest font size were adjusted (this feature is accessible in all smartphones regardless the operation system) and all subjects declared that they can read words and numbers clearly.

Tasks

The participants were asked to complete different tasks using the smartphone. Tasks were listed based on their difficulty, the easiest tasks selected first. After explaining the procedure of the study to the participants, they were asked to unlock their phone and then the tasks were as follows: They were asked to find "Mrs. Pour Mohsen" in the contact list and call her. Afterwards, they were asked to dial a new number and save it as "Maryam", text a specific sentence (Hi, meet me in YAS center) and send it to Maryam. Afterwards, they were asked to set an alarm, and finally, to locate the nearest bank using the map app on the smartphone (see Figure 1). Unlocking the smartphone was the first task. This task was created to find the location of the lock key and sliding a finger on the touchscreen in order to unlock the phone. Task 2 was designed to find a specific contact and calling him or her. This task was aimed to search the "Mrs. Pour Mohsen" name's then calling her. Third task was included adding a new number to the contact list and save it as a new number in the contact list.

In the next task (task four) subjects were asked to find the messenger app, and tap the "new message" icon, select the recently added contact, and type out the text message. The fifth task was a little challenging, they were asked to set an alarm. The most difficult task was the ability to work with map to find the nearest bank using a map app.

Each accomplishment task time was recorded using a stopwatch and the conversations between the observer and participants were recorded via a voice recorder. Finally, the participants were asked to fill out a Persian version of SUS questionnaire [21-22] to score their satisfaction with the smartphone based on VAS (0 means no satisfaction and 100 for completely satisfied) [23].

System usability scale is a popular, reliable, and precise questionnaire which applicable in various purposes. This scale contains 10 items with response scale from 1 to 5 (1 strongly disagree and 5 strongly agree). In this scale, items with odd numbers have positive tones and even numbers have negative tone [24-26]. As it was mentioned above, the additional analytical tool in this study was Visual Analog Scale (VAS) which is a continuous single-item scale to clarify a person's satisfaction when they are working with the smartphone. This scale is a 100 mm long horizontal line from 0 to 100 (0 means no satisfaction and 100 means extreme satisfaction). The exact question was "Are you satisfied with a smartphone?" the way of answering this scale was mentioned beneath the scale also it was explained to the participants verbally [27]. Finally, the statistical analysis of this study was calculated via SPSS Statistics software Version 24.0.

RESULTS

The average age of the participants was 68.7±4.38 years-old. Participants had been using smartphones for an average of 2.8±1.22 years. Thirty three percent of participants worked three hours per day with their devices, and texting was prevalent among 55.6% of participants. One handed grip (which means typing with the right index finger and holding the device with the left hand) was common in 94.4% of the participants.

Experimental Procedure

This study was contained 6 main tasks, SUS, and VAS scales. In the first task participants were asked to unlock the smartphone which on average took 45.6 s to be completed. The result of the second task, finding a specific contact and calling him, required about 79.4s to be completed. On overage, the process of adding a new number to the contact list and saving it (task 3) took about 119.5 s.

For the participants in this study, sending a text message to a recently added contact (task 4) took about 113.5 seconds. Based on subjects' statements, the fifth task (setting an alarm) task was a little challenging for users since most of them didn't usually set an alarm, and whenever necessary, it was done for

them by a member of their family. Among all the participants, 8 of them declined to try this task since they thought that it might cause the phone to malfunction. Completing this task took, on average, 54s for the rest of the participants, however, all of them they were helped to find the location of the relevant app to start as they didn't understand the meaning of icons. According to the participants' declaration the most challenging part of this study was the last task which has no experience to deal with. 27 of the participants avoided to try this task, since they believed that they wouldn't be able complete it, and even considering the task caused some levels of anxiety. Only 3 men initiated this task, but after 48 s they abandoned this task. They claimed that this task may decrease their self-confidence and feel incompetent. Consequently, no one finished this task.

Questionnaires

The average score of System Usability Scale (SUS) questionnaire was 59.13 (min 37.50 and max 83). Additionally, participants rated their satisfaction related to the smartphone on average 62.5.

Fig. 1. Left to right and the top to bottom: unlocking, finding a contact, saving a new number, texting, setting alarm, and using a map application

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Table 1. Demographic data correlation coefficient

	Age	Alone	Level of Education	Task
Age	1	-.430	-.496*	-.305
Alone	-.430	1	.197	.172
Level of Education	-.496*	.197	1	.004
Task	-.305	.172	.004	1

**Correlation is significant at the 0.05 level (2-tailed)*

Table 2. Study methods correlation coefficients

Variables	SUS	Satisfaction	Age	Level of Education
SUS	1	.369	-.692**	.542*
Satisfaction	.369	1	-.239	-.150
Age	-.692**	-.239	1	-.496*
Level of Education	.542*	-.150	-.496*	1

*** Correlation is significant at 0.01 level (2-tailed)*
** Correlation is significant at 0.05 level (2-tailed)*

DISCUSSION

The results of this study indicated that there were no relationships between age and the type of task required (as shown in Table 1). Most participants preferred to use the messenger application instead of calling. Since unlocking the smartphone, generally considered a simple task, took about a minute to be completed by the participants. It can be concluded that the most users didn't know how to work with a new phone and also didn't understand the meaning of "swipe to unlock".

The results of this study showed that there was a relationship between age and the score of usability, as shown in Table 2, which means that age decreases the rate of usability. Also there was a relationship between the level of education and usability score. Accordingly, higher levels of education may help easily utilizing smartphones and provide more usability. In contrary, those with lower level of education believed that the smartphone are less usable.

Based on satisfaction scores, it is necessary for the elderly to use new technologies and learn how to use them to keep in touch with family and friends as Page et al. found in his study [2].

Some of the participants were afraid of setting the alarm and most of them were afraid of working with the map application; they tended to only do familiar tasks and use only their own smartphone. These results were consistent with previous studies [2-14]. The results of this study approved Tsai and Van Biljon's finding which indicated that typing was hard for elderly users, and it took them many wrong taps in order to select the right key, therefore they needed smartphones with bigger touchscreens and larger buttons [12-15].

In a friendly conversation, the participants claimed that the technology was perfect, and they were

not able to tap correctly due to weak-eyesight or big fingers, blaming themselves for their low performance. The present study did not support the results of previous studies claiming that the elderly believed that smartphones were not designed properly for people on their age and had many flaws [2]. Additionally, participants expressed a desire to take part in classes (alongside others in their age group) to learn how to work with their smartphones, because family members usually didn't instruct them on how to use smartphones and just solved their problems. These results were consistent with Bernard's findings [28].

The present study had some limitations. Some people were afraid to use a smartphone other than their own phone and felt anxious and stressful, sometimes cause to withdraw from the study, and possibly negatively affecting their performance. Also, all the participants were talkative, and sometimes talked about their experiences with their own phone, while completing the task required of them, and this might influenced the time taken to finish the task.

The results of this study have one main implication, and that is the need for designing smartphones for elderly users with specific physical and cognitive criteria based on the elderly's abilities and limitations.

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CONFLICT OF INTEREST

There is no conflict of interest for any of the authors.

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