Comparative Analysis of Mobile Phone Usability for Younger and Older Adults

Mahmood Ashraf¹, Sehrish Majeed¹, Thabit Sabbah², Mohammad Abrar³ and Furkh Zeshan⁴

¹Department of Computer Science, Federal Urdu University of Arts, Science and Technology Islamabad, Pakistan; mahmood@fuuastisb.edu.pk, sehrishmjd@gmail.com

²Al-Quds Open University Ramallah, Palestine Palestinian Territory, Occupied; thabit.s.sabbah@gmail.com

³Department of Computer Science, Bacha Khan University, Charsadda, KP, Pakistan; abrar@bukc.edu.pk

⁴Department of Computer Science, COMSATS Institute of Information Technology Lahore, Pakistan; drzfurkh@ciitlahore.edu.pk

Abstract

Objectives: This effort is part of research work that aims to propose common guidelines of mobile phone usability for younger and older adults. **Methods/ Statistical Analysis:** This study provides the comparative analysis of mobile phone usability for younger and older adults. The data was collected from 30 users through questionnaire method; in which 15 were younger adults while remaining 15 were older adults. Simple mobile phone was used in this user study because of their popularity and usage in Pakistan. **Findings:** Few interaction problems of both age groups have been identified in this study which may lead to proposing guidelines onwards. **Application/Improvement:** The proposed guidelines based on this research can tackle the usability issue, which arises while designing mobile phones because users have to access various functionalities through small interface. It will help to improve the user experience in younger and older adults.

Keywords: Mobile Phone Usaility, Older Adults Mobile Phone Usage, Usability Components, Younger Adults Mobile Phone Usage,

1. Introduction

Mobile phone is considered as one of the commonly used communication devices. It provides benefits to people of all age groups. They can use it for different purposes including calls, messages, playing games and internet connectivity¹. The use of mobile phones is increasing with the advancement in communication technology because its features and functionality is increasing with the rapid increase in requirements of users. Mobile phone is considered as the rapidly spreading communication device. The increasing demand, usage and functionality of mobile phone make it an important device which should be studied in different aspects².

Usability is a quality attribute that describes how easy is to use an interface³. Learnability, efficiency, memorability, errors and satisfaction are five main components of usability³. The main issue for mobile designing and service is usability because users have to access different functionalities through limited User Interface (UI). Simplicity and interactivity are two key determinants of mobile phone usability. Pre-condition for positive interactivity and usability experience is having a simple interface⁴.

People of different age groups have different experiences with technologies because they use different generations of technologies. Children, older adults, and younger adults show various behaviors while using interactive systems⁵.

These study amid to examine the usability of mobile phones for younger and older adults. It provides the comparative analysis of mobile phone usability for younger and older adults in Pakistan. The data collection method used in this study was questionnaire.

2. Literature Survey

Usability is the basic problem of users because they have to use mobile phone having limited interface, when they are busy. This limited interface for input and display screen has explored the need of effective user interface because users have to put more effort to use it. The studies found that better user interface has positive effect on the success of mobile services. Simplicity and interactivity has positive effect on usability while usability has positive effect on satisfaction, brand trust and brand loyalty. Simplicity has positive effect on interactivity and satisfaction has positive effect on brand trust⁴.

People having mean age 21.8 are considered as younger adults while having mean age 67.1 are older adults. Similarly, Younger adults can also have age between 19-51 years and older adults can have 61-86 years age. The performance of younger and older adults was examined in a study while performing tasks including pointing, dragging, crossing and steering. Generally older adults' performance is less than younger adults but touch screen has decreased this performance gap. Touch screen devices has reduced the movement time of cursor to 35% for older adults and 16% for younger adults. The performance of younger and older adults has improved due to the invention of touch screen devices. This invention also reduced the error rates⁶.

Older adults need easily understandable user manuals, large font size, large icons and urgent feedback of operations. They felt difficulty while using soft keys and multi tap operations. Younger adults put more emphasis on non-visual aspects and connecting their phones with internet and other devices than older adults².

Performance of older and younger adults was best while using QWERTY and voice input method. Handwriting input method was proved to be least effective for both younger and older adults⁸.

Awareness and attractiveness, soft keys and multi-tap, concern of learning, touch screen, social influence and connectivity are six determinants of acceptance of new functions by older adults, which were selected from ten factors that can influence their acceptance. Device acceptance is different from function acceptance².

Slower adoption of mobile phones contributes as a reason for older adults' difficulties while using mobile phones. According to a survey, among 82% of older adults only 49% use mobile phones. The use of supportive scaf-

foldings can play an important role in learning process of older adults for the use of mobile phone. Both older and younger adults put more emphasis on individual learning than group learning¹⁰.

3. Method

Quantitative and Qualitative are two methods which can be used to explore mobile phone usability issues¹¹. This study adopts the quantitative research method in collecting users' responses and data analysis.

3.1 Design

Questionnaire designed for this study has mainly four parts including consent form, pre-study questionnaire, tasks to be performed and post-study questionnaire. Pre-study questionnaire contains seven questions. These questions gather personal data of users and also get data about usage of mobile phone. The next part contains the tasks which users have to perform at mobile phone. Nokia 1280 mobile phone was used in this user study to accomplish the following tasks:

- Set alarm,
- Create a group and send message to that group, and
- Search a contact in received messages, save that number and then dial it.

The questions of post-study questionnaire were adapted from Neilson's usability heuristics. Post-study questionnaire contains twelve questions. Likert scale of 5 points was used to capture the responses of participants to these questions.

3.2 Participants

Sample of 30 participants was selected to perform this user study. All participants were using the same Nokia 1280 model cell phone.

Participants of this user study were divided into two groups, older and younger adults as shown in Table 1. Among these 30 participants, 15 are older adults of age group (above 50) and 15 are younger adults having age group (18-35) years. In older adults 9 participants were male and 6 were female while in younger adults' group 10 participants were male and remaining 5 were females.

	Age Group	Male	Female	Total
Younger Adults	18-35	10	5	15
Older Adults	Above 50	9	6	15

Table 1.	Sample	information	of participants
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3.3 Experimental Design

Users performed the study in a peaceful environment at the same mobile phone. Proper time and guidance were provided to all participants of user study.

3.4 Procedure

User study was performed at different locations according to user's convenience. Pictures of some participants were captured during the user study.

After having questionnaire, firstly participants have to sign a consent form for taking part in the user study. After that they fill pre-study questionnaire, having questions for taking their personal and mobile phone usage information. Participants performed three tasks on mobile phone which they were asked to perform. After performing the representative tasks, they filled the post-study questionnaire using 5 point-likert scale.

4. Data Analysis

In this section, the data collected from the participants is analyzed according to their age group which is shown in Table 2.

Table 2. Age related difference of data collectedfrom users

Attributes	Values	No. of Adults		
Attributes		Younger	Older	
Qualification	Less Than Matric	0	3	
	Matric	0	7	
	Bachelors	14	3	
	Masters or above	1	2	
Age	Below 20	5	0	
	20-35	10	0	
	Above 50	0	15	

Gender	Male	10	9
	Female	5	6
Status	Student	14	0
	Job holder	1	5
	Retired	0	4
	Other	0	6
Duration	6 months	0	2
	Less than 2 years	5	1
	5 years	4	2
	5 years or more	6	10
Purpose	А	2	6
a: Call	В	2	0
b : Messaging	E	1	0
c: Alarm	a & b	2	1
d: Games	a, b & c	1	5
e: Internet	a, c & d	0	1
f: Other	a, b & f	0	1
	a, b, c & d	2	0
	a, b, c, d & e	5	1
Daily Usage	Less than 30 minutes	1	4
	1 hour	1	2
	Less than 5 hours	2	4
	5 hours or more	11	5

4.1 Younger Adults

Among younger adults 10 participants were male and remaining 5 were female. Among the 15 younger adults, 14 were students having qualification bachelors and only 1 participant was job holder having qualification masters. 5 participants have age below 20 and 10 have age between 20-35 years. 5 younger adults were using mobile phone for less than 2 years, 4 were using for 5 years and remaining 6 were using for more than 5 years. 2 younger adults were using mobile phone for calling purpose, 2 for messaging, 1 for internet connectivity, 2 for call and messaging, 1 for call, messaging and alarm, 2 for call, messaging, alarm and games, and 5 for call, messaging, alarm, games and internet connectivity. Among younger adults 1 participant use mobile phone for less than 30 minutes daily, 1 for 1 hour, 2 for less than 5 hours and 11 for 5 hours or more.

4.2 Older Adults

Among 15 older adults, 9 were male and 6 were females. 4 participants were retired, 5 were job holder, 3 were house wives, 1 was doctor and 2 did not mention their status. 3 participants have qualification less than matric, 7 have matric, 3 have bachelors and 2 have masters or above. 2 Older adults were using mobile phone for 6 months, 1 for less than 2 years, 2 for 5 years and 10 for more than 5 years. 6 older adults use mobile phone only for calling purpose, 1 for call and messaging, 5 for call, messaging and alarm, 1 for call, messaging and other, 1 for call, alarm

and games, and 1 for call, messaging, alarm, games and internet connectivity. 4 older adults use mobile phone for less than 30 minutes daily, 2 for 1 hour, 4 for less than 5 hours and 5 for 5 hours or more.

5. Results and Discussion

Overall usability value of older adults is greater having sum 682 and mean value 45.45 while younger adults' have sum 664 and mean value 44.25. Responses of Younger adults during user study are shown in Figure 1.







Figure 2. Older adults responses towards usability heuristics.

Results show that button base mobile phone is more usable for older adults and they feel comfortable while using it. Age related differences of usability with mean and Standard Deviation (SD) are given in Table 3. For visibility of system status older adults' values are 4.2 and 1.2 while for younger adults values of 3.73 and 3.02 were recorded for mean and SD respectively. Older adults show higher values for visibility of system status than younger adults which indicates that this feature of used mobile phones is more suitable for older adults. The difference in the values shows that younger adults need better software in which system status is more visible to user.

Table 3.	Age related difference of usability with
mean and	standard deviation

O No	Heuristics	Younger Adults		Older Adults	
Q. 110.		Mean	SD	Mean	SD
1.	Visibility of System Status	3.73	3.02	4.20	1.20
2.	Match Between System and Real World	4.00	2.08	4.13	2.25
3.	Control and Freedom	4.13	2.69	4.33	2.35
4.	Consistency and Standards	3.73	2.95	3.53	3.19
5.	Error Prevention	3.6	3.13	3.53	2.91
6.	Recognition rather than Recall	4.13	2.18	4.47	2.50
7.	Efficiency	3.93	1.52	4.53	1.94
8.	Attractive	3.07	1.96	3.47	2.96
9.	Simple	3.67	2.52	3.93	1.48
10.	Discover Error	3.13	4.05	1.73	2.70
11.	Help	2.73	3.19	3.00	3.64
12.	Documentation	4.40	1.80	4.60	2.01

Values of mean and SD for match between system and real world of older adults are higher (4.13 and 2.25) than younger adults (4 and 2.08). It shows that younger adults want the kind of software which has more resemblance with real world. Older adults have more control and freedom on mobile phone functions (mean: 4.33, SD: 2.35) than younger adults (mean: 4.13, SD: 2.69). Mobile phone should be designed in a way that user have full control and freedom to use it. Younger adults show higher values for consistency and standards (mean: 3.73, SD: 2.95) than older adults (mean: 3.53, SD: 3.19).

Younger adults need better images, icons and symbols for performing different functions on their mobile phones. Younger adults prevent more errors (mean: 3.6, SD: 3.13) than older adults (mean: 3.53, SD: 3.19) which shows that younger adults use mobile phone more frequently than older adults (Zhou et.al., 2014). Error prone conditions need to be simple and visible to user. Older adults rated higher value (mean: 4.47, SD: 2.5) for recognition rather than recall as compared to younger adults (mean: 4.13, SD: 2.18). Younger adults want that there should be less typing input they just want click or selection inputs. Older adults rated higher value (mean: 4.53, SD: 1.94) for efficiency than younger adults (mean: 3.93, SD: 1.52). These results show that younger adults want mobiles which respond more quickly. Mobile phone selected for the study is more attractive for older adults (mean: 3.47, SD: 2.96) than for younger adults (mean: 3.07, SD: 1.96).

The results show that the display of that mobile phone was less attractive it should be more colorful and attractive. Older adults rated higher value (mean: 3.93, SD: 1.48) for simplicity than younger adults (mean: 3.67, SD: 2.52). Older adults want simple phone which can be used for calling purpose while younger adults want phones having more features including internet connectivity, different Apps and games. Younger adults discover more errors (mean: 3.13, SD: 4.05) than older adults (mean: 1.73, SD: 2.7). Older adults mostly use mobile phone for call or simple functionalities including alarm and messaging but younger adults want featured phones. Older adults rated higher value (mean: 3, SD: 3.64) to help than younger adults (mean: 2.73, SD: 3.19) because older adults need help during using the phone but younger adults need less help. Older adults (mean: 4.6, SD: 2.01) rated more for documentation than younger adults (mean: 4.4, SD: 1.8). Few common interaction problems of both age groups have been identified which are as follows:

- Display was not attractive,
- Lack of error prevention messages,
- Difficult to discover errors, and
- Absence of Help.

These interaction problems should be addressed, so that simple mobile phone becomes more usable for users of both age groups.

6. Conclusion

This study compared the mobile phone usability of younger and older adults through questionnaire method, adapted from Nielson's Heuristics. Despite of advancement in technology simple phones are still popular in Pakistan among people of all age groups because they are easy to handle and carry. Common interaction problems have been identified. Both younger and older adults have problems related to attractiveness, error prevention, help and errors. Further investigations are required in this area. This study can be enhanced to describe results according to other demographic parameters including gender, qualification, usage purpose and duration etc.

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