

Mobile Phone Usability Evaluation for Older Adults

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ABSTRACT

Mobile technology is the most admired communication technology for older and young adults in the world. Older adults face various barriers and challenges when it comes to adopting new technologies. The study is experimental and observational. The main objectives of this study were to investigate the purpose of mobile phone usage by older adults, problems they have faced and their requirements regarding mobile phone. There were 30 participants involved in this study. During study it seems that there were so many differences between educated and less educated older adults. The study focused on hardware base problems and those were size/shape, weight, buttons, font size on buttons, screen/ display, color, call speaker problems. The assumptions have also been analyzed. The reasons and their solutions to get rid of uncertain conditions have also been made in this study.

Keywords: Mobile phone, usability guidelines, older adults.

1. INTRODUCTION

Mobile technology is the most admired communication technology for older and young adults in the world. Older adults face numerous barriers and challenges when it comes to adopting new technologies. This study investigated the use of mobile phone that for what purpose they use mobile phone and what kind of issues they faced. Mobile phones become personal item for all the age of people. According usability perceptive older people want to learn and use maximum but due to complexities, they avoid to use it, so by helping of these guidelines usability of mobile phone would be increase among older adults. So several years ago the study of the relationship between older people and mobile communications are small [26,19,3,16] but now older adults want to learn new technology and they failed because they faced many issues so for investigating these problems and their solutions a user study performed to meet their needs.

In the history of Pakistan the literacy late was very low. Older people need to learn and lot work done but no one has highlighted usability of mobile phone for older adults as they are in considerable number in our society. Mobile Phone become essential part of personal and business life and its usage cross all age and gender boundaries [10]. But older adults are slow to adopt mobile phone technology because they face many problems, like design interface, unwanted and complex functions, cost, difficult technical wording, learning and remembering the innovative technology [2,5,7,8,10,]. By resolving these problems usability should be amended and then mobile phone technology can play vital role in older adult's life.

The evaluation of mobile phone is based on five usability components on mobile phones. Section II presents the literature review while Section III details the user studies. Data Analysis is elaborated in Section IV. Results are highlighted in Section V, discussion in Section VI and paper is concluded in Section VII.

2. LITERATURE REVIEW

Usability is the usage of any system which helps the people to achieve their responsibilities and goals effortlessly and speedily [2]. Some researchers mention that older adults as 65+, two groups are 'young old' (60 – 75),

and 'old old' (75+) which have 60 above age [35]. Interpreting of United Nations, it is estimated that the number of people over 60 will be increased by the year 2050 [15].

There are several roles of mobile phone for older people, but the main is social communication, which provides security and safety [4]. Mobile phone is a vigorous technology for older adults for communication with relatives, friends and make sure that they are safe [6]. Mobile phone technologies performance became enormous technology and the aged population challenges are tackled by using internet through mobile phone technology [5]

Increasing importance of technology, older adults also attracted and they are adopting this technology swiftly but much slow [18]. Helping of mobile phones technology, life of older adults is growing as they are connected with their loved ones, they are in contact with each others. Many older adults want to learn the current mobile applications and services but they experienced difficulty [26] because they use mobile phone for very limited purposes, calling or texting in emergency situations [8].

Screen, keys and shape of mobile are extremely important for mobile phone design. While pressing the buttons they press wrong buttons [5,16,17]. The gist of this study is to identify the mobile phone usability problems, likeness, dislikeness and purpose of use by research questions

For this purpose two techniques, Interview and Questionnaire were used. Interview is a technique that is used to determine user views and normally used in order to understand 'user requirements and their needs [23]. "IS" studies generally employ quantitative research approach to study user perception by using questionnaires as instruments for data collection (Wong, 2013). SPSS (version 15.0) used for data analysis. This user study contains personal experience, usability aspect information and specific questions.

3. USER STUDY

A. Study Introduction

The first experimental and observational study was planned to examine the mobile phone usability by older adults. The study draws the attention of the user towards the usefulness of mobile phone.

B. Design

Questionnaire has two parts: 1st was on personal information and 2nd part was based on hardware to have idea about the demands of people under study.

All the questions were asked about their own mobile phone that they were currently using.

A five point Likert-scale was used for user compliance having '1' as 'strongly disagree' and '5' as 'strongly agree' [17].

The pre test questionnaire consists of participant's personal and experience information. Information include:

- Age
- Gender
- Education
- Current Status

The post test questionnaire consists of the following representative tasks:

- Dial a number
- Type a message
- Lock/Unlock phone

Personal observations were also made during user study.

C. Participants

For gathering the information first of all we thought that how to meet older people and how to convince them for interview. A total number of 30 older adults (10 females and 20 males) were interviewed from different places that are mentioned earlier. There were some conditions to choose participants as:

- Only older people (Male, Female) are taken.
- Older people which have age 60 or above.
- Have their own mobile phone.
- All participants had been using mobile phones for more than one year.

The demographic details of the participants are as follows (Figure 1).

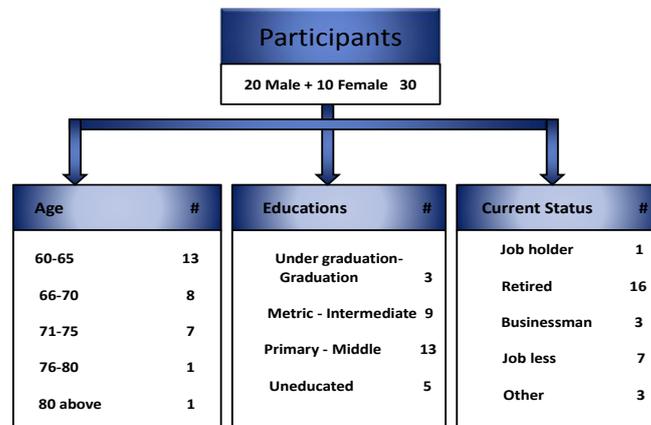


Figure 1: Demographic details.

D. Experimental Design

The study was based on performing representative tasks by the participants. Only 60 years above participants were involved. Fifteen minutes time was planned for each participant to perform. Participants performed the tasks within a specific time. Participants were free to ask questions in case of difficulty.

E. Procedure

The study was mainly conducted at various places like parks, hospitals, banks, bus stops and hotels for interview. However, some users were available at their convenient locations. Participants were observed through their facial expressions while performing tasks.

Some participants were captured from behind after their approval. After pre test questionnaire, post test questionnaire has been presented to the participants (Figure 2).

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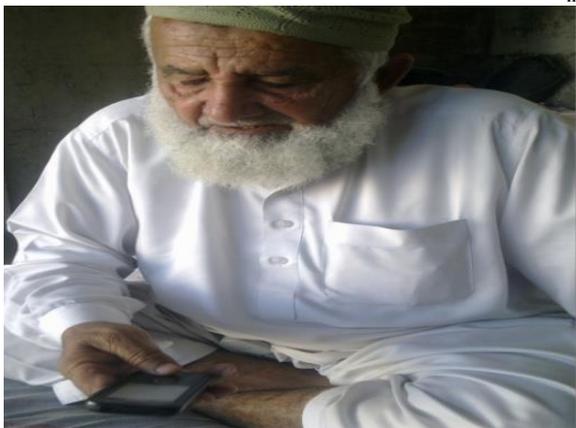


Figure 2: User performing tasks.

The results showed that the participants selected “Agree” (40%) from Likert-scale, while 60% of the users were “Strongly Agree” (Figure 4).

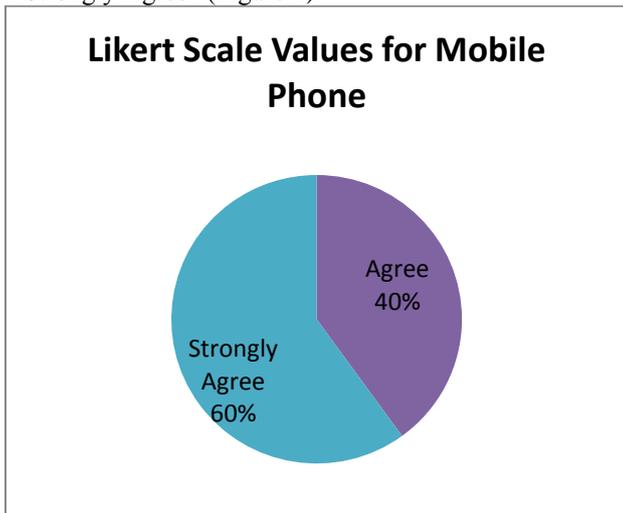


Figure 4: Likert-scale values percentage for mobile.

4. DATA ANALYSIS

The Likert-scale values have been recorded for mobile phone in table and the analysis of Likert-scale values for mobile phone as shown in figure 3. All the questions based on usability components.

Table 1: Data analysis for mobile phone.

Questions	Mobile Phone Usability				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Q 1				4	6
Q 2		1	2	4	3
Q 3			3	6	1
Q 4			1	7	2
Q 5			3	1	6
Q 6			4	2	4
Q 7			1	5	4
Q 8			2	3	5
Q 9		1	3	2	4
Q 10	3	4	1	1	1
Q11		1	4	4	1
Q12	1	2	1	2	4
Q13			3	4	3

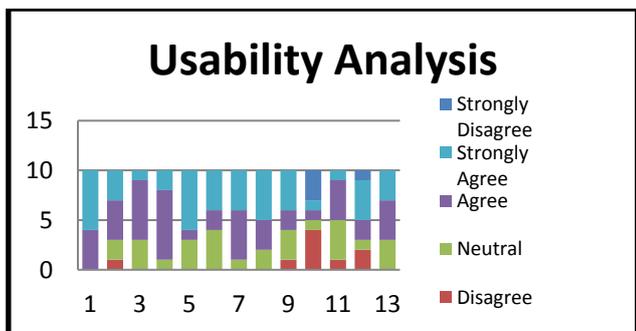


Figure 3: Likert-scale values selected by users.

5. RESULTS

The overall results after detail analysis showed that the user’s reactions were tending towards “Agree”. The evaluation usability principles are discussed below.

Evaluation of Usability Principles

The usability principles have been evaluated as follows:

i. Learnability

First three questions in the post test questionnaire based on learnability principle. After compiling their results it was analyzed that No participants choose “strongly disagree, disagree and neutral” but 18 participants “agree” and 12 participants “strongly agree” for this principle.

ii. Satisfaction

The other three questions based on satisfaction principle. Accordingly, only One participant was “strongly disagree” 4 participants were “disagree” 7 participants were “neutral” 13 participants were “agree” and 5 participants were “strongly agree”.

iii. Efficiency

The next three questions based on efficiency principle. Result analysis showed that only 2 participants were “strongly disagree” 12 participants were “disagree” 4 participants were “neutral” 5 participants were “agree” and 7 participants were “strongly agree”.

iv. Memorability

In the response of question 10 and 11, based on memorability principle, only one participant “strongly disagrees” 3 participants were “disagree” 2 participants

were “neutral” 16 participants were “agree” and 8 participants were “strongly agree” on this question.

v. Error

The second last question identified error principal. As a result, No one choose the option of “strongly disagree” but 10 participants were “disagree” 9 participants were “neutral” 7 participants were “agree” and 4 participants were “strongly agree”

vi. Error Correction

The last question was based on error control principal. 5 participants strongly disagree, 13 disagree, 3 participants neutral, 8 participants agree, only 1 participant strongly agree that he felt problem while using mobile phone.

6. DISCUSSION

After compiling all the results it was analyzed that the response of the participants moved towards a right path but some assumptions have been made during experiment. Some of the participants felt hesitation and been confused while performing representative tasks. The assumptions and responses analyzed during experiment. These responses will draw attention towards the betterment of design and reduce cognitive burden from user’s mind.

1. Felt Discomfort due to Complex Interface (Learnability)

Learnability principle describe that how much easily a user can perform a task during first interaction to the device. It was observed that the participants felt discomfort while interacting the mobile phone first time. This issue can be resolved if interface would be simple and impressive.

2. Burden on Mind (Satisfaction)

Satisfaction principle describe the level of comfort of user. It showed that how much participant felt pleasant while performing tasks. The participants felt bored and burden on mind due to small button size and small font size on button. The size should be large, and font color should be readable.

3. Confused during Performing Tasks (Efficiency)

Efficiency principle showed that how much efficiently a user can operate the device. The participants were confused due to complex interface. It creates cognitive burden on user. This issue can be solved by making structure and operations simple.

4. Unable to Repeat the Task (Memorability)

Memorability principle showed that how much quickly a user use the device after some time of first attempt. Due to a long series of steps for performing the tasks, the participant was unable to perform the task again after some time. Some steps skipped from his mind. To get rid of this

problem, short cut keys should be implemented and guidelines should be made.

5. Mistakes during Tasks Performance (Error)

Error principle represents the errors committing degree by the user. The participants consign error or mistakes due to their less knowledge about the device. To resolve this issue proper guidance requires.

6. Error Control

This principle describes that after committing an error how much quickly and how much it was easy for user to get rid of this situation. The participants were unable to resolve this issue because there were no proper arrows or guidance to go back to the pervious step. To solve this issue, ever mobile phone must have navigating errors to go back or move forward to get rid of this situation.

7. CONCLUSION

Mobile phone becomes one of the most commonly used devices. This study is designed to determine that why older adults use mobile phone and while using mobile phone which type of issues they encountered and what was their requirements. So different results arise and there was so much difference between views of educated and less educated participants. Less educated participants said they use mobile phone for social communication such as call, but educated participants said they also use mobile phone for other purpose like alarm, game, calendar, clock, music and camera. But no one of all participants used mobile phone for messaging. Older adults those use mobile phone only for calls has no interest about other functions.

Older adults faced hardware and software both problems but this study focused on hardware base problems and those problems were Size/Shape, Weight, Buttons, Font size on buttons, Screen/ Display, Color , Call speaker and battery problems. If these problems may be resolved then mobile phone became useful for all the age of users.

After compiling all the results of experimental and observational study it is concluded that for the betterment of mobile phone usability, it is necessary to design the device for older adults according to this proposed guideline:

1. Buttons should be soft
2. Screen should be large
3. Shape must be attractive
4. Interface should be user friendly
5. Weight should be less
6. Speaker volume should be loud
7. Mobile color should be appealing
8. Font size should be readable

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- Buttons: Soft, large
- Screen: Large
- Shape: Attractive
- Weight : Less
- call speaker : Loud
- Mobile color: Appealing

REFERENCES

- [1]. Leung, R., McGrenere, J., & Graf, P. (2011). Age-related differences in the initial usability of mobile device icons. *Behaviour & Information Technology*, 30(5), 629-642.
- [2]. Lindsay, S., Jackson, D., Schofield, G., & Olivier, P. (2012, May). Engaging older people using participatory design. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 1199-1208). ACM.
- [3]. Leung, R., Tang, C., Haddad, S., McGrenere, J., Graf, P., & Ingriany, V. (2012). How older adults learn to use mobile devices: Survey and field investigations. *ACM Transactions on Accessible Computing (TACCESS)*, 4(3), 11.
- [4]. Gelderblom, H., van Dyk, T., & van Biljon, J. (2010, October). Mobile phone adoption: Do existing models adequately capture the actual usage of older adults?. In *Proceedings of the 2010 annual research conference of the south African institute of computer scientists and information technologists* (pp. 67-74). ACM.
- [5]. Olwal, A., Lachanas, D., & Zacharouli, E. (2011, May). OldGen: Mobile phone personalization for older adults. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 3393-3396). ACM.
- [6]. Van Biljon, J., & Renaud, K. (2008). Predicting technology acceptance and adoption by the elderly: a qualitative study.
- [7]. Duh, H. B. L., Do, E. Y. L., Billinghamurst, M., Quek, F., & Chen, V. H. H. (2010, April). Senior-friendly technologies: Interaction design for senior users. In *CHI'10 Extended Abstracts on Human Factors in Computing Systems* (pp. 4513-4516). ACM.
- [8]. Tang, C., Leung, R., Haddad, S., & McGrenere, J. What Motivates Older Adults to Learn to Use Mobile Phones.
- [9]. Gelderblom, H., Van Biljon, J., & Van Dyk, T. (2010). Mobile phone adoption: Optimising value for older adults in a developing country.
- [10]. Sustar, H., Jones, S., & Maiden, N. (2011). Creativity in Older People Designing Digital Devices.
- [11]. Ziefle, M., & Bay, S. (2005). How older adults meet complexity: aging effects on the usability of different mobile phones. *Behaviour & Information Technology*, 24(5), 375-389.
- [12]. Hernández-Encuentra, E., Pousada, M., & Gómez-Zúñiga, B. (2009). ICT and older people: Beyond usability. *Educational Gerontology*, 35(3), 226-245.
- [13]. Mori, K., & Harada, E. T. (2010). Is learning a family matter?: Experimental study of the influence of social environment on learning by older adults in the use of mobile phones. *Japanese Psychological Research*, 52(3), 244-255.
- [14]. Van Dyk, T., Gelderblom, H., Renaud, K., & van Biljon, J. (2013). Mobile Phones for the Elderly: a design framework. In *International Development Informatics Association Conference* (pp. 85-102).
- [15]. Koutsourelakis, C., & Chorianopoulos, K. (2010). Icons in mobile phones Comprehensibility differences between older and younger users. *Information Design Journal*, 18(1), 22-35.
- [16]. Nasir, M. H. N. M., Hassan, H., & Jomhari, N. (2008). The use of mobile phones by elderly: A study in Malaysia perspectives. *Journal of Social Sciences*, 4(2), 123-127.
- [17]. Chen, K., Chan, A. H., & Tsang, S. N. (2013). Usage of mobile phones amongst elderly people in Hong Kong.
- [18]. Sulaiman, S., & Sohaimi, I. S. (2010, June). An investigation to obtain a simple mobile phone interface for older adults. In *Intelligent and Advanced Systems (ICIAS), 2010 International Conference On* (pp. 1-4). IEEE.
- [19]. Malik, S. A., & Azuddin, M. (2013, November). Mobile technology for older people: use of personas. In *Research and Innovation in Information Systems (ICRIIS), 2013 International Conference on* (pp. 97-101). IEEE.
- [20]. Zainal, A., Razak, F. H. A., & Ahmad, N. A. (2013, December). Older People and the Use of Mobile Phones: An Interview Study. In *Advanced Computer Science Applications and Technologies (ACSAT), 2013 International Conference on* (pp. 390-395). IEEE.

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- [21]. Lin, M., & Sears, A. (2007). Constructing Chinese characters: keypad design for mobile phones. *Behaviour & Information Technology*, 26(2), 165-178.
- [22]. Sarraute, C., Blanc, P., & Burrioni, J. (2014, August). A study of age and gender seen through mobile phone usage patterns in Mexico. In *Advances in Social Networks Analysis and Mining (ASONAM), 2014 IEEE/ACM International Conference on* (pp. 836-843). IEEE.
- [23]. Malik, S. A., & Azuddin, M. (2013, December). Qualitative Findings on the Use of Mobile Phones by Malaysian Older People. In *Advanced Computer Science Applications and Technologies (ACSAT), 2013 International Conference on* (pp. 435-439). IEEE.
- [24]. Salman, Y. B., Kim, Y. H., & Cheng, H. I. (2010, August). Senior—friendly icon design for the mobile phone. In *Digital Content, Multimedia Technology and its Applications (IDC), 2010 6th International Conference on* (pp. 103-108). IEEE.
- [25]. Qihui, W. (2008, October). The Effects of Interface Design About Mobile Phones On Older Adults' Usage. In *Wireless Communications, Networking and Mobile Computing, 2008. WiCOM'08. 4th International Conference on*(pp. 1-4). IEEE.
- [26]. Kurniawan, S. (2008). Older people and mobile phones: A multi-method investigation. *International Journal of Human-Computer Studies*, 66(12), 889-901.
- [27]. Díaz-Bossini, J. M., & Moreno, L. (2014). Accessibility to mobile interfaces for older people. *Procedia Computer Science*, 27, 57-66.
- [28]. Petrovčič, A., Fortunati, L., Vehovar, V., Kavčič, M., & Dolničar, V. (2015). Mobile phone communication in social support networks of older adults in Slovenia. *Telematics and informatics*, 32(4), 642-655.
- [29]. van Biljon, J., & Renaud, K. (2008). A qualitative study of the applicability of technology acceptance models to senior mobile phone users. In *Advances in conceptual modeling—Challenges and opportunities* (pp. 228-237). Springer Berlin Heidelberg.
- [30]. Wilkowska, W., & Ziefle, M. (2009). Which factors form older adults' acceptance of mobile information and communication technologies? (pp. 81-101). Springer Berlin Heidelberg.
- [31]. Lin, C. J., Hsieh, T. L., & Shiang, W. J. (2009). Exploring the interface design of mobile phone for the elderly. In *Human Centered Design* (pp. 476-481). Springer Berlin Heidelberg.
- [32]. Wong, C. Y. (2013). A framework of affordance and usability of mobile user interface for older adults. In *Universal Access in Human-Computer Interaction. User and Context Diversity* (pp. 231-239). Springer Berlin Heidelberg.
- [33]. Al-Razgan, M. S., Al-Khalifa, H. S., & Al-Shahrani, M. D. (2014). Heuristics for Evaluating the Usability of Mobile Launchers for Elderly People. In *Design, User Experience, and Usability. Theories, Methods, and Tools for Designing the User Experience* (pp. 415-424). Springer International Publishing.
- [34]. Conci, M., Pianesi, F., & Zancanaro, M. (2009). Useful, social and enjoyable: Mobile phone adoption by older people. In *Human-Computer Interaction—interact 2009* (pp. 63-76). Springer Berlin Heidelberg.
- [35]. Lawry, S., Popovic, V., & Blackler, A. L. (2011, September). Diversity in product familiarity across younger and older adults. In *Diversity & Unity, 4th World Conference on Design Research, IASDR2011*.
- [36]. Kurniawan, S. (2007). Mobile phone design for older persons. *interactions*,14(4), 24-25.