Touch-Based Mobile Phone Interface Guidelines and Design Recommendations for Elderly People: A Survey of the Literature

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Abstract. Mobile phones are becoming a great necessity for elderly people; the features they provide supported by rich functionality made them one of the indispensable gadgets used in their daily life. However, as mobile phones get more advanced and their interfaces become more complicated, new design recommendations and guidelines need to be developed to serve the elderly needs. In this paper we present a set of guidelines and design recommendations for touch based mobile phones targeted towards elderly people. These guidelines were distilled and consolidated after a comprehensive review of the literature. We hope that these compiled guidelines will serve as an information base for future designers/developers to use while designing touch based mobile interfaces for elderly people.

Keywords: Elderly people, Mobile phones, Accessibility, Design Recommendations, Guidelines.

1   Introduction

The number of elder people has increased rapidly in recent years [1-3]. Increasing ageing societies has appeared the most among developed countries such Japan, Europe, and North America. The United Nations have projected that by 2050, elderly above the age of 60 will reach a percentage up to 21% of the world population.   This increase in elderly numbers represents a recurring need for establishing suitable market of computing technology devices for elderly people [5].

   As people get older some of their physical and mental capabilities start to decline [3]. In order to overcome these losses of capabilities for elderly people, recent studies have focused on the development and adaption of technological tools to help the increased number of elderly in society [1][4]. Among these technologies is the mobile phone.

   Mobile phones are becoming one of the more utilized technology items for older people. Some of the reasons why older people possess mobile phones are because they are used as memory aids, let them feel safe and secure, keep them related to

social activities and the most important reason is enabling them to perform their daily life activities independently [2] .

Recent studies showed that the main concern among older people with regard of using mobile phones resides in their complex interfaces and overrated features [4]. The elderly in these studies were related to overly complex interfaces and excessive functionality. This problem might hinder the ability of older people to send text messages or call their relatives because they are afraid of making mistakes. In addition, previous studies have found that mobile phones have built-in features that cannot be modified according to elderly needs.

However, as of today's market, we can see an increase in the number of touch-based mobile phones such as (iPhone, and Android) [2]. Touch-screen mobile phones offer a suitable screen size for older people with many features that can be adjusted according to their needs. Among these features are bigger buttons, larger text message, and spoken interfaces. However, this diversity in touch-based mobile phone market reveals the need for sound design recommendations and guidelines for the design of mobile interfaces for elderly people. Therefore, the overarching objective of this paper is to distill and consolidate guidelines and design recommendations for touch-based mobile phone interfaces appropriate for elderly people. This will be the first step towards providing an information base for future designers/developers intending to design touch based interfaces for elderly people.

The rest of the paper is organized as follows: section 2 reviews the literature related to mobile phone and elder people.   Section 3, provides a compiled list of design recommendations and guidelines from previous studies put into an ad hoc framework. Section 4, concludes the paper with future research directions.

2   Literature Survey

There have been many research studies in the use of mobile phones among elderly people. We will present in this section some of the related work that has started from 2002 up to date. An early study presented in [6] concentrated on identifying the important wireless devices and services needed for older people. They articulated the user feedback into a concept scenario to generate design ideas for new products and services; then prioritized the ideas based on the elder's feedback. The result of the study showed a positive opinion about additional values of the services. The study found that the important criteria for senior persons were the ease of use and true need of the device for facilitating independent living. In another study presented in [7] the author pointed out that standard interface techniques are not appropriate for elder users. Designers have to think of the functionality of the output message to design suitable system for older people. Nevertheless the study performed by the authors in [8] addressed touch-based PDA usage by older people and their performance with respect to younger people. Their findings suggest that there are no major differences in performance between older and younger users while physical interaction with PDAs.

Additional study of the use of mobile phones by older persons was discussed in [9], it used a mixed method of quantitative and qualitative approaches to discover the

design improvements for the elderly. Older people have strong opinion about some of the advanced features presented in mobile phones such as: the use of one button to lock the cell phone, a panic button for emergency,   a screen with only four menus (voice call, text, alarm, and calendar), and button to place unwanted people in the blacklist. Along the same line of research, the author in [10] reported that mobile interfaces had too many menus, and the functions in mobile phones were complicated and difficult to understand. The author indicated from her interviews with elders, the three most-desired functions in mobile devices, which are: address book, diary, and an alarm clock.

The authors in [11] indicated senior users did not purchase their phone; instead they were given to them by relatives (children) or friends. From their observations, it was clear that the ease of use does not influence the intention to purchase a cell phone; instead it prevents senior people from utilizing the functions available in the mobile phone. Their findings related the factors of acceptance with adaption of the mobile phone for elder users.

A comparison study conducted by [12] found that the communication media used by both senior and younger people was the cell phone. An opposite study in [13] revealed that older people fear the use of a new technology and preferred mobile phone with aid features to support their declining abilities.

Touch-screen devices have recently increased in the market. To make these devices more effective and easy to use, the introduction of multimodal feedback from more than one sensory modality had taken place. This kind of feedback is more suited for elder users. The study in [14] demonstrated the enhanced performance for older adults when presented by multimodal feedback with auditory signals through touch-screen devices. Also, to help elderly better deal with touch-screen phones, the study in [15] provided a guideline to icon feedback design for elderly to make the touch screen friendlier.

Investigation of special touch-screen tablets' designs for elderly users was presented in [16, 17]. The authors addressed the important features for seniors. To help seniors remain socially connected and reduce their loneliness, the building bridges project in [16] suggested involving elderly people at every stage of the design process of the technology to be part of their life. Also, in [17] they investigated the optimal number of blocks and targets for a touch-screen tablet intended for seniors. The results do not recommend designing an interface that require the use of two-hands for elderly; and to improve the performance of elder adults, the designed interface has to reduce the cognitive overload for the elderly.

Moreover, the authors in [18] introduced a new tabletop device with touch-based gestural interface to help the elderly communicate with their social network. Some of their design ideas were: elderly people prefer tap gestures because it is easy to understand and remember; also when the touch on the screen is lost during dragging objects, the object should stay where it has been left. Lately, the authors in [19] presented an evaluation of (iPad) current model. Their results showed high acceptance and satisfaction rate among senior users. This finding was clear for both seniors who had experience with PCs and those who had not any experience.

Recent studies have focused on identifying important interface features requested by elder people. The authors in [20] argued about blindly reducing the functionalities

that are not effective for elders' mobile-phones. Due to the fact that existing mobile phones do not address the needs of elder people. The authors proposed a worth-driven mobile phone design process to meet the needs of aged people. In addition, the authors in [4] identified the important functions for elderly. They preferred a larger display, a touch-screen, labeled icons and larger fonts. Other features can be eliminated such as the ones related to entertainment.

In a different research where the authors tried to tailor mobile phones to specific user needs, the work in [21] introduced the idea of portable mobile-user interface. This interface can be installed in any mobile-phone regardless of its model or brand. Their prototype addressed the usability problems in existing mobile -phones. As well as the user needs to learn only one user interface and be able to install it in any new phone. Moreover, the author in [22] presented some guidelines for the design of interfaces for elderly people, which was used to develop Mylife application. Mylife is a flexible application that can be presented in touch-screen devices.

Finally, the authors in [23] conducted an experiment to assess standard usage of mobile touch-screen interfaces when used by elderly. Their results showed that elderly are interested in using touch-screen devices, and when provided with one week of training, their performance has increased.

From the above survey, we can can conclude the acceptance of touch-screen devices among elder adults, and suggest a future focus on the interface and applications development for seniors.

3   Consolidated Guidelines and Design Recommendations

Guidelines and design recommendations for mobile phones' interfaces for the elderly is not a new research topic, Kurniawan [10] has already compiled a list of design recommendations targeted for feature phones (this term is used to describe low-end devices with physical keypad). However, to the best of our knowledge we have not seen similar papers targeting touch-based mobile phones.

In this section, a list of design recommendations will be presented based on our extensive literature review. The recommendations are compiled from [4, 5, 9, 14, 16, 17, 18, 20 and 22] and classified into three dimensions, namely: (1) Look and Feel, (2) Functionality and (3) Interaction.

1) Look and Feel
This design requirement includes the following:

- Larger size of mobile phone that consists of three-dimensional appearance button for touch-screens,
- Separate keypads for numbers and letters,
- Good spacing between buttons,
- Larger font for text, and labeled icons.
- In addition, the most important feature should be available directly via a labeled button and not via menu navigation.

2) Interaction

This design requirement includes the following:

- Easy zoom in and out and pinching.
- Tapping with audio confirmation to help elderly with reduced vision.
- Also, the elderly prefers tapping but not drag and drop actions, voice call and slow motion interface.
- The interface should also clearly express where the user is in the dialogue, and which "tasks" are active.
- Moreover, the designer should avoid the following for elderly interfaces:

  − Avoid slide-out keyboard because it bothers the elderly,
  − When the touch is lost during dragging, the object should stay where it has been left,
  − Do not overload the same object with actions performed by tapping and by dragging gestures, and
  − Finally, the screen should not turn off when being idle to avoid confusion. The elder might think that the mobile is not working.

3) Functionality

The most desired functions for elderly are the following:

- Address book linked with caller identification number along with a picture of the caller and on-screen number selections (e.g., press 1 for calendar), i.e. functionality of the same type should be grouped together,
- The main navigation should be placed identically on all "pages", and critical functions should never disappear, and important functions should be placed at the top of the screen to avoid mistake touches.
- Additional request by elderly to have specific buttons for the following actions: single button to return to the home state, a locking button to prevent accidental dialing, a panic button for emergencies, and a button to place a caller/number into the blacklist.
- On the other hand designers should carefully consider naming programs and commands; not too many or too less features for mobile phone interfaces.

Using the above design recommendations will help developers to design the appropriate user-friendly mobile phone interfaces for elderly people and help them use and enjoy this type of technology.

4   Conclusion and Future Work

In this paper, we have conducted a thorough literature survey of the usage of touch-screen devices among elderly people. Based on our extensive study we were able to distill and consolidate a set of design recommendations and guidelines classified into three dimensions, namely: (1) Look and Feel, (2) Functionality and (3) Interaction. This framework of design recommendations can serve as an information base for designer to use when designing touch-based interfaces for elderly people. Our next

step will be to test whether these recommendations are applicable for Arab elderly people with no or minimum modifications.

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