

Interfaces Affordable for Smartphones to Elderly: a Screen Layout Proposal for Sending Messages

Franciele Alves dos Santos
Medina
Universidade Paulista
Rua Dr. Bacelar, 1212
Vila Clementino – São Paulo
+55(11)5586-4145, 04026-002
cieli_fran@yahoo.com.br

Vanessa Rodrigues da Silva
Universidade Paulista
Rua Dr. Bacelar, 1212
Vila Clementino – São Paulo
+55(11)5586-4145, 04026-002
van117@live.com

Sergio Gustavo Medina Pereira
Universidade Paulista
Rua Dr. Bacelar, 1212
Vila Clementino – São Paulo
+55(11)5586-4145, 04026-002
medinasergio@yahoo.com

Rodrigo Franco Gonçalves
Universidade Paulista
Rua Dr. Bacelar, 1212
Vila Clementino – São Paulo
+55(11)5586-4145, 04026-002
rofranco@osite.com.br

Ivanir Costa
Universidade Nove de julho
Av. Francisco Matarazzo, 612
Barra Funda– São Paulo
+55(11) 3665-9355, 01156-080
icosta11@live.com

ABSTRACT

This study aims to propose a screen layout solution for messaging in smartphones by older users. For this, we use the concepts of Usability and Accessibility as theoretical basis. The sample chosen for the pretest of the questionnaire were 25 people. But 4 these results was dismissive. For the theoretical framework, we present a review of the literature in national and international databases. We can conclude that older users would like to use their smartphones for a variety of tasks, but feel much difficulty in the interaction process. In the results were proposed two types of layouts. We concluded there is still a gap in relation to the elderly users and smartphones.

Categories and Subject Descriptors

D.3.3 [Programming Languages]: Design, Human Factors.

General Terms

Design, Experimentation, Human Factors, Standardization, Theory.

Keywords

Accessibility, Usability, Intuitive Interaction, Elderly people, Smartphones.

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1. INTRODUCTION

The lack of experience in the latest technologies, such as smartphones, has made it difficult its use among the elderly. This difficulty in using new technologies is directly related to the elderly think or if it can not be useful for your life [3].

According to [9], in 2010 had about 20.5 million older people living in Brazil, where 63% of this population had a disability. The National Sample Survey of Domicile (National Household Survey) estimated that the number of elderly has reached over 26 million in 2013 [10].

Although the number of elderly is continuously growing, there is still a lack of adjustments to the technological devices to the most advanced of age, this research considered people over 60 years old. The technology is becoming indispensable and necessary in everyday life, however, are not all groups of people who can enjoy them.

The limitations resulting from physical and psychological aging process, become problems in the elderly interact with technology. This is due to the fact that the interfaces do not take into consideration sensorial, motor and cognitive changes that occur in the body as we age [2, 15].

Presently, mobile devices such as smartphones and tablets, are part of our day-to-day; helping us in our routine activities and offering several facilities in our daily lives.

However there is still no concern in adapting these devices for elderly people who find it difficult to use them and end up rejecting a device that could make its simplest daily tasks.

Poverty, low levels of education, lack of family computer support for online communication, lack of income to invest in a computer without Internet access are certainly barriers we have to overcome in order to promote the adoption of such a platform.

In their studies [4] propose that the rapid spread and popularization of mobile phones are promoting extensive un field of new opportunities. They understand that a specific group has not yet been achieved, as people with different levels of physical restraints, either because of a disability or even by age.

The interactivity of the Internet and its impact on the inclusion of the elderly population seems to be still largely ignored. However, a change in shape and old concept itself is changing as well [14].

It is important that accessibility and usability concepts in mobile device interfaces are applied, so that anyone can enjoy the advantages that these devices provide. When applied, the user can be free to use regardless of their limitations devices.

This paper aims to provide layout proposals that are accessible to elderly users. By studying the needs identified in an evaluation questionnaire of satisfaction they may have compared to smartphones. The focus of this work are the screen design for messaging, which was a recurrent complaint in the survey data.

This paper discusses an applied research through a questionnaire and is organized as follows. Initially, the literature review examines the relevant theoretical concepts on accessibility and usability. Section 3 discusses the methodology used in the article. In Section 4 the results are presented. This study is concluded in section 5, where the final considerations, limitations and future work are presented.

2. LITERATURE REVIEW

2.1 The elderly and touchscreen technology

Lack of knowledge on modern technology reduces the acceptance of smartphones among the elderly. Making them have no interest in using these devices [3].

Also according [3], the elderly accept using mobile devices when they realize how much can be useful and make your life easier. Knowing the benefits of using smartphones, you can persuade them to use their services.

Research shows that by using technological devices, the elderly were able to accomplish the tasks that anteriormente were not able perform without assistance provided [2].

Still for [2], the elderly also have a little afraid to make use of modern technology because they often do not take into account the changes in the course of aging. One point that may discourage their use is the lack of functional ability and physical elderly. So it is important that the interface is set to the special needs and limitations of the public. Some points may undermine confidence further in the use of modern devices such as the lack of experience or negative experiences that older people had previously.

Generally associate the aging phenomena only to chronological and biological. But beyond the strictly biological component, one should consider the aging process as a dynamic balance between physical, psychological and social problems. For this it is required a multidimensional approach in order to provide a specific intervention for an active and healthy aging, as it promotes the "capacity of an adaptive response to challenges associated with advancing age" [16].

2.2 Accessibility and Usability

The authors point out in their study that the development of information and communication technologies should be changed according to their functions in electronics projects [12]. When added new features to the device the same influences how the user handles its user interface (UI). Specifically for mobile phones, which in addition to providing telephone communication service and messaging service (SMS), as entered new forms of interaction such as multimedia functions, digital cameras, games, among others. These factors are due to the fact that usability is a property growing and susceptible user preferences making it extremely subjective.

According to [1], the definition of usability criteria is part of a wider project, which aims to develop methods and techniques that can incorporate ergonomic considerations into the design process and evaluation of human-computer interface(HCI).

The change in the context of use and formal interaction model, requires the inclusion of new interface models that allow such tasks continue to be performed easily, providing the user achieve his goal with the shortest time possible [13].

According to [12] although in essence, have roots in Cognitive Science, the term usability began to be used at the beginning of the 80s, especially in the areas of Psychology and Ergonomics, as a replacement of the term "user-friendly "(which was considered too vague and subjective).

In fact, users do not need the machines are friendly. Just that they do not interfere in the tasks they want to accomplish. In addition, different users have different needs, so that a system can be friendly to a person and not as friendly to another.

On mobile devices simplicity is taken as a basic aesthetic, for developers the following principle is to create friendly and useful to the user interfaces with focus on the device in question. As well as issues related to accessibility are no longer an option for developers, are a requirement. The authors also address the fact that even in the accessibility sites are still poor in quantity. When it is mobile that number further decreases due to the number of new devices inserted in the market, the technology also changes, so the existing solutions do not apply to all contexts. [8, 4]

There are some developing guides focusing on accessibility facing the elderly or with a disability, in Table 1, are listed some of the existing and their main goal.

For IOS devices specifically aimed at elderly users an exclusive guide is not found, the company has an iOS Human Interface Guidelines general, which addresses concepts such as adaptivity and Layout, Starting and Stopping, Navigation, Modal Contexts, Interactivity and Feedback, Animation, branding, Color and Typography, Icons and Graphics, and others. (IOS Human Interface Guidelines).

Table 1: Development of Guidelines for layout screens

Guidelines	Concepts
World Wide Web Consortium (W3C)	The aim is to collect a set of common barriers to mobile users and disabled people being effected in four different contexts: Perception, operability, comprehensibility and robustness.
Age-centered Research-Based Design	Addresses concepts such as: Target Design, Use of Graphics, Browser Window Features, Content Layout Design, User Cognitive Design, Use of Color and BackGround.
Android Accessibility Practices	Adopts concepts such as descriptive text Adding to user interface controls. Audio prompts are always accompanied by another application or visual notification, to help users who are deaf or hard of hearing, among others.

Adapted from BOSSINI, J. M. D., MORENO, L (2014).

3. METHODOLOGY

The first stage consisted in the analysis of the needs of elderly users, their main difficulties and limitations. The collect data it was performed by test questionnaires applied on people over 60 years old. The questionnaire was applied in a digital inclusion project for seniors, where they learn the handling of personal computers. At first, the questionnaire test was applied on 25 users.

The questionnaire was composed of 2 parts. The first step was the identification of personal factors such as age, sex, education and familiarity with smartphones. In the second step the users indicated how they felt about related tasks (satisfactory to unsatisfactory).

It was used a Likert scale ranging from very satisfactory, neutral to unsatisfactory and the SAM (Self Assismnt Manikin) for demonstrate the emotions of user. The sampling procedure was done for convenience.

The methodology for measure users satisfaction and their psychological influences was the SAM.

The SAM was originally implemented for an interactive computer program, and later was expanded to a version for use with pencil and paper to be used in groups and in large masses. [17]

It is a scale composed by 9 points, represented by figures that indicate the emotional reactions to a particular factor. These emotional dimensions have their own scale.

One that represent the valence, as shown in Figure 1A and the other one represent the alert, as shown in Figure 1B.

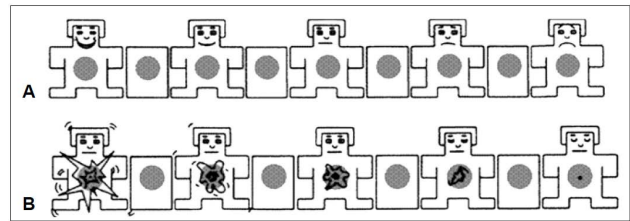


Figure 1A and 1B: Valence scale and alert, respectively.

Figure 1A shows the variation between two states, satisfied (nice) to a unsatisfied (unpleasant). Figure 1B represents the variation between an aroused state (stimulated / activated) to a relaxed state (inert), represented in the figure in the center of the figure [17].

The second stage consisted in the application of techniques and prototyping tools for development of a more accessible interface. When using prototyping techniques, you can check what problems of usability and accessibility interface has before there high development costs.

A non-friendly interface requires the user to have a better understanding of the system. Using virtual prototyping, the system can be constructed for viewing and simulation engine to validate and enhance performance [5, 6].

According to the necessities pointed out in the questionnaire using the Uxpín tool, it was developed some screen solutions for messaging on smartphones. The tool available on the site <https://www.uxpin.com>. According to [6] in prototyping, failures related to development, design and planning could be detected before many expenses were compromised.

4. RESULTS

A questionnaire was developed and delivered to a group of 25 elderly. Four of which questionnaires were disregarded because users do not correctly answered the questions or not understood. The data collected then have a sample of 21 people. The average age was 69.33 years old, 4 males and 17 females. Regarding education had 6 elementary school, 7 high school, 6 graduates and 2 postgraduates.

It has been observed that education not influenced positively or negatively user interaction with the device. Another recurring issue was that during the questionnaire most elderly requested that in addition to the course that that besides the course they attended (basic computer) are already provided some lessons on operability in smartphones.

Of the 21 people who answered the questionnaire 12 they have used or use a smartphone. Nine of them have never used. This sample six elderly reported not using for believing be difficult to use, only 2 of them see the device as something unnecessary in your routine.

Of the twelve elderly users who already have smartphones the most common complaint was in relation to the size of the letters and the very small spacing between them. They also emphasize that they would like to use your smartphone to other tasks such as sending messages, whatsapp, facebook such tasks that involve interaction with other users were the most frequent.

Meeting the needs of the elderly has produced a prototype screen where the graphical user interface with keyboard and increased icons, with a scroll button to make it easier for older people in the act of sliding the screen. The keyboard is defined positioning of each key for each letter. The simulated device is the Android Lollipop.

In Figure 1, it is the model used for the study without modification. In this model the user need to scroll to read messages but without a certain area, which impedes understanding.

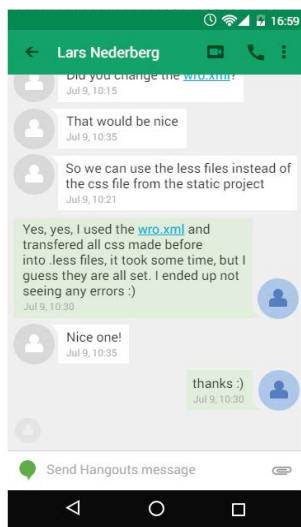


Figure 1: Lollipop Android Smartphone with current reading screen.

Figure 2 shows the proposed model for reading, simulating a scroll screen; it is possible to delimit a space by using metaphors (arrow pointing up and down), which allows an intuitive navigation.

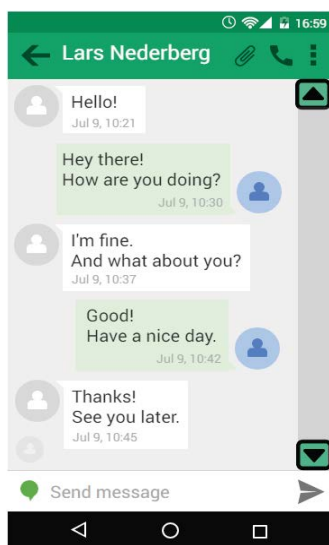


Figure 2: Lollipop Android Smartphone with scroll insertion.

In the original smartphone keyboard researched, the contrast between the background colors and letters, as shown in Figure 3, may impair reading, there is also an enclosed area for the keys, which can confuse the user that has no familiarity with these types devices.

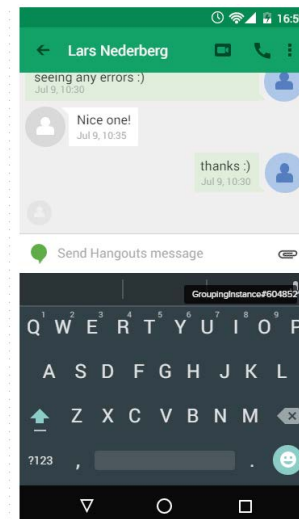


Figure 3: Lollipop Android Smartphone with original keyboard.

The updates in Figure 4 as the increase of the sources and the provision of visible boundaries between the keys to facilitate user interaction. Also remained the scroll bar to read the previous posts.

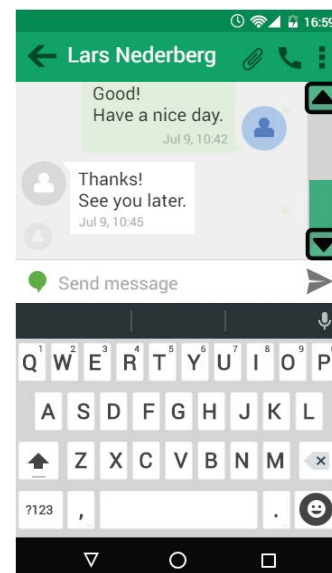


Figure 4: Smartphone Android Lollipop with new keyboard proposal.

When considering the population over 60 years, one can see that the decline in cognitive abilities occurs gradually and is inherent in the physiological process of normal aging and, therefore, arises

as a natural consequence of advancing chronological age, and is not automatically an obstacle to normal operation (Moreira & Oliveira, 2005).

This decay referred to the authors, are some of the factors that is intended to mitigate the study best provisions of layouts in graphic touchscreen interfaces.

For future works, it is planned a development functional prototype for apply the concepts and validate, with a sample of elderly users.

5. CONCLUSION

In the present scenario, there are many factors that must be evaluated in relation to mobile devices such as the strong growth in consumer smartphones and tablets. Must also be considered that this technology has lower cost. Compared to personal computers have become accessible to a large segment of the population.

It must also be considering aspects of heterogeneous public (age, sex, level of knowledge, etc.) that uses it, and the variety of applications for different activities they provide. Are required in order studies on its usability, accessibility, graphical user interfaces, interaction methods, user-centered design, application of metaphors, and use of Gestalt laws applied to the interface design.

In this study was approached some of these issues as accessibility and usability, even allowing for the insertion of the other for a more comprehensive study on aspects of interaction

From the data evaluated in the questionnaire and observations made during the process, it was raised that older people feel the need to participate in the technological evolution.

There are several studies that address the aspects of the elderly with the technology, but there is still a gap in the elderly /mobile device relationship. The resolutions of these devices, and screen sizes become challenging to use. It should also be considered that such devices are touch screen, and require specific sign and a certain precision in performing the tasks.

Existing interfaces for sending messages are based in the personal computer keyboard model. This fact makes it easier to use the keyboard for people who are used to typing on them. In the case of elderly who were not so familiar with these keyboards, this typing becomes a complicated process because the order in which they appear the letters is different from that used them.

The proposed solution of this study was at first improve the contrast between the background and the letters, a small increase in fonts, and demonstrate a physical division between the keys. The scroll bar inserted for reading messages is intended to assist the elderly in the scroll contents on the screen.

As a final result screen at this stage of the study, it can be observed that small changes such as the increase in 2 to 4 pixels in size of the sources. And the inclusion of well-defined boundary between the keyboard key can help to that interaction is intuitive and the learning curve of a new user is enjoyable, allowing it to reach your goal in a short time.

In future work, we will create more models of keyboards in different sizes and devices. These models will be functional prototypes that allow user interaction with the keyboard. It will be conducted usability testing and validated the layout templates screens according to the elderly satisfaction in the interaction.

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