

Interaction With Mobile Devices by Elderly People: The Brazilian Scenario

Ricardo Roberto Leme, Luciana A. M. Zaina and Vitor Casadei
 LERIS-Laboratory of Studies in Networks, Innovation and Software
 Federal University of São Carlos
 Sorocaba, Brazil
 rleme@ufscar.br, lzaina@ufscar.br and vitor.casadei@gmail.com

Abstract—The use of mobile devices in Brazil has grown in different groups of people, making it an essential element in people’s daily communication. Although there is a high concentration of users in the age group 20-40 years, it is the visible increase in the number of people over 60 that interacts with mobile devices, especially smartphones. These different groups of different ages have different needs with regard to interaction with mobile devices. The objective of this paper is to present the results of an exploratory study on the interaction of the older users with mobile devices in Brazil. For this, we used an exploratory study with potential users in Brazil. The exploratory study outcomes allowed us to draw the personas for the Brazilian scenario. The main interaction personas were identified and defined from this survey, aiming at an efficient representation of the group studied. The survey showed us that although the majority of users had mobile devices and used them for daily activities, some of them still face difficulties on handling them.

Keywords-mobile devices; elderly user; personas.

I. INTRODUCTION

The proliferation of mobile devices has been increasing in recent years around the world. Currently, there are about 2.5 billion mobile phones in the world and about 80 % of the population has network coverage. It is estimated that in 2015 there will be over 5 billion active mobiles [1].

This phenomenon also occurs in Brazil. Among the most commonly used mobile devices can highlight the smartphone with the resources that are increasingly seeking to improve user interaction with the resources of the devices and their applications. However, the needs and preferences are diverse forms of interaction for each group of users, as elderly users.

According to the United Nations [2], there are currently nearly 900 million people aged 60 or more in the world. The expectation is that, by 2050, this number will reach 2.4 billion people, demonstrating that population growth among the elderly will be faster compared to other sectors of the population. In Brazil, this growth is no different. According to the 2010 Censo [3] prepared by IBGE (Brazilian Institute of Geography and Statistics), the population aged 60 or older, which was 4.8 % in 1991, came to 5.9 % in 2000 and reached 7.4 % in 2010. The institute is estimating that in 2025 the population of elderly people in the country will reach 34 million people. Evaluating the last decade, the number of elderly in the country increased by almost 4 million people, the result of vegetative growth and the gradual increase in average life expectancy. This is certainly

a large group of people, with growth trend in the coming years.

The purpose of this article is to identify the characteristics of the users of old age and collect the main forms of use, difficulties and facilities in view of this group of users. The identification will be obtained through an exploratory study on the interaction of this group of users with mobile devices in Brazil. From this survey, we identified and defined the main personas interaction, aiming at an efficient representation of the group studied. As a contribution, it is hoped that this article demonstrates for developers of applications for mobile devices, the need to design specific forms of interaction for users of old age.

The paper is structured as follows: Section 2 presents the exploratory research and discussion of the survey results, Section 3 presents personas raised and Section 4 discusses some conclusions of the research.

II. EXPLORATORY SURVEY

Users interact with computer systems, whether in desktop environment, web or mobile elements via its user interface (the part visible to the user of the system). This interface can be understood as a space of communication, one semiotic system in which signs are created and used to promote communication [4] [5]. The challenge of a user interface is to provide a space for communication so that this makes sense to the user who will use it [6]. During the searching for references on the subject, no articles were found about South America. Observing the lack in this area, the main goal was to collect data of the older user groups, analyzing their difficulties.

In this sense, the development of interfaces for mobile devices public-facing seniors should clarify the meaning that these users have in relation to the environment and the systems in which they interact in their day-to-day [7].

In order to achieve the goal, a questionnaire was formulated and given to the target audience. The planning and carrying out of the activity are described below.

A. Planning

Marconi and Lakatos [8] claim that an exploratory research can use questionnaires, interviews, participant observation and content analysis. In this work, we decided for the development and application on a questionnaire online; the application targeted for users participating in two groups of elderly. The content of the questionnaire was assembled based on related work and the goal set. The

questionnaire has two sections, namely, the first on education level, age group and sex, and the second one on the use of mobile devices for seniors. In the survey on the age of the subjects, we planned to include users from age 50 to survey trends for the next decade. Although there are changes in the knowledge given in relation to technological developments, it is clear that users of old age usually fail to follow this evolution. If in the past the difficulty was the interface of a VCR (Videocassette Recorder) tape, now is the interface of a smartphone, which can be anticipated here for 1 or 2 decades? With this, it is observed that age exerts a strong influence on the use of information technology and communication in which there is a significant reduction from the 50 [9]. Nine (9) questions were prepared, and one (1) open ended question was and the other multiple choice.

Established the goal, hypothesis, methodology and materials used for the verification of the object of study:

- Hypothesis: Considering the users' interaction with the elderly mobile devices, there are many difficulties or points that could be improved to meet the needs of this user group.
- Objective: Collect the main forms of use, difficulties and facilities in the view of users of elderly facing the operationalization of mobile devices.
- Methodology: The proposed map the use of users of old age and thus define the personas, the user group was invited to participate in the completion of a questionnaire survey of socio-cultural and the use of mobile devices.
- Handout: To conduct the exploratory experiment we prepared a Questionnaire Survey Profile containing issues of social and cultural so that you can trace profiles of those users.
- Target Audience: Elderly users of social network Facebook to participate in groups.

B. Execution of the Survey

The presence of elderly users in the software market is still modest; considering the participation in Brazil of elderly users (aged 60 or older) on Facebook, for example, it is lower than 1% [10]. However, in the past few years there has been a growth in participation, and considering the current users aged 50 or above, which will be part of this group over the next decade, there will be a participation of more than 4%. Although this percentage does not seem expressive, it will represent over 2.8 million users [10] just in Brazil. Through the social networking site Facebook, an explanatory message was posted on the research and inviting the administrators of 41 groups of elderly in different cities of the country to publish the link of the research groups of closed social network.

The phase of contact with the administrators of groups of seniors, it was a very positive surprise, where the vast majority talked about the importance of research with this group of users. Only administrators of two groups (one from a local authority and other social network) showed resistance in the questionnaire. To these, we performed a more detailed explanation of the real goals.

The questionnaire was also applied to two elderly groups located in the city of Itu in Brazil with 8 people filling it manually. The link to the questionnaire has been accessed 297 times and got a total of 263 responses. For mapping the number of clicks, we used the Google URL Shortener [23] and the electronic form was created through Google Drive [24].

C. Results and Discussion

In the consolidation of the results, we considered both questionnaires in groups of elderly as the electronic questionnaire, totaling 271 participants.

Understanding the educational, social and cultural issues assists in the process of formalizing the characteristics of the user group to be studied [8]. With this, we have analyzed the responses of users from the perspective of their profiles. The results are shown below.

The majority (98%) of respondents responded to the survey via the electronic form available on the Internet; 63% were female; 91% have cell phone.

For many users, one smartphone can become the only way to connect to the Internet [11], and, with it, the same way one can use a desktop PC, several software interface elements, completely different between each application, can be installed. Thus, it was raised from the research subjects, if besides their cell, how many % were smartphones. The survey shows that 149 subjects (56 %) have a smartphone, while in male subjects the number of people who have a smartphone reaches 72 %. The age range of respondents is 14 % between 51-59 years, 74 % between 60-75 years, 12 % between 76-85 years, and 0.01% or only 3 users older than 85 years.

Figure 1 shows that a majority of respondents (54 %) had higher education is "full" or "Post Grad". However, according to the questionnaire, 8 % of people have only the "elementary school incomplete", demonstrating that mobile devices are used by people with different levels of education; since, the motivation in creating interfaces considering the experience of non-specialist users of different ages and levels of knowledge [6].

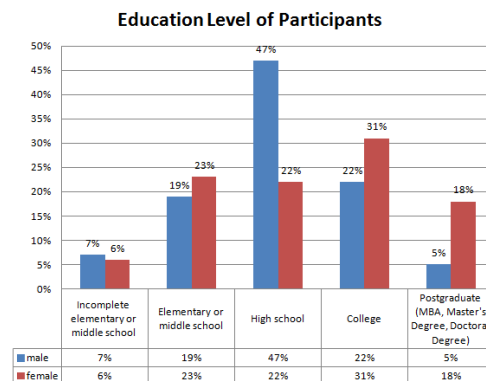


Figure 1 - Level of study by age

The users were asked about the main difficulties in the use of mobile devices (more than one option could have been selected). The highlight was the difficulty of visualizing the interface elements, where 58% of users above 76 years

showed that "the letter of the text is too small", while 37% mentioned that "I have trouble seeing the images of the cell". The complete survey of the difficulties can be seen in Table 1.

TABLE I. MAIN DIFFICULTIES ENCOUNTERED IN THE USE OF MOBILE DEVICES BY ELDERLY PEOPLE

Difficulty Pointed	To 60 years	From 60 to 75 years	Above 75 years
The letter of the text is too small	12%	38%	58%
I have trouble seeing the images of the cell	8%	21%	37%
I find it hard to click on the buttons	4%	18%	29%
The programs are very complicated to use	17%	23%	41%
I do not have any difficulty	48%	22%	11%

Subjects above 60 years showed "having no difficulty" in the use of mobile devices; 72 % are "Higher" or are "Post Graduates", demonstrating a trend where the level of education can directly influence the difficulty of the operation of the interface.

The survey in Table 1 corroborates the set of challenges proposed by Nilsson [12] in developing user interfaces for mobile devices, where a major challenge is the efficient use of screen space, through the using different layouts that are appropriate to the device, mechanisms for grouping the information, screen scrolling, management of dialogues with the user from keyboards to touch screens resizing and management interface for different devices and types of users.

Considering a qualitative research, a essay question was included on other difficulties encountered in mobile devices, where tissues were some comments: 'The configuration program has hidden options'; 'I find it interesting that the cell facilitates the lives of elderly since the technology is a permanent thing in our day-to-day.'. 'Why interaction with new technology is so complex?'

In order to verify the actual use that elderly users make of with their mobile devices, they were asked to talk about besides, what other interactions were performed on the devices (more than one option could have been selected). The result of the survey can be seen in Figure 2.

Use of mobile devices by older users in Brazil

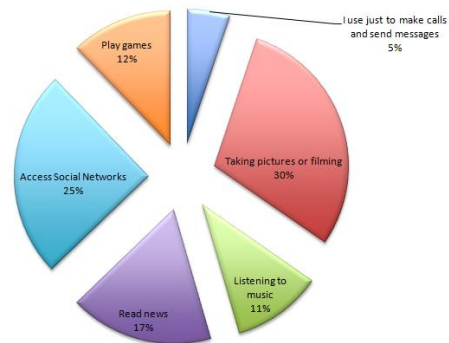


Figure 2- Use of mobile devices by elderly users

Aiming to raise new possibilities of development for mobile devices (smartphones and tablets with touch interaction), there were three questions, as shown in Table 2, in which the subject can respond if "not would be interested", "would some interest" or "Had a lot of interest" in each item.

TABLE II. POSSIBILITIES FOR NEW INTERACTION IN MOBILE

Activity	No Interest	Interest	Very Interest
Read updates from mobile phone only moved his hand	42%	53%	5%
Instead of writing the message, can dictate the phone the desired text	24%	30%	46%
Enable the cell to read aloud updates mobile	53%	37%	10%

It was observed that, according to Table 2, 77 % of the subjects had 'Interest' or 'Very Interest' to use the drive in the device reading the update messages mobile device, and 76 % shown 'Interest' or 'Very Interest' for "can dictate text instead of writing the message". Only the activity Enabling "mobile reading aloud updates cell" had a majority group 'No Interest' totaling 53 %. This item demonstrates that the development of a mobile application in order to reach all audiences, should also consider the needs and desires of a specific audience, such as the elderly people. In Brazil, about 80% of Internet aged users have education level above the national average, and economic classes are more favorable [13]. Thus, it is critical that developers of mobile applications consider the specific needs of this group of users, since the declines coming from natural aging can affect the users' interaction with the interfaces.

Based on the motivation of this paper, a comparison of the results of this study was carried out conducted in Brazil, South America with information in United States, North America [21][22]. The result can be seen in Figure 3.

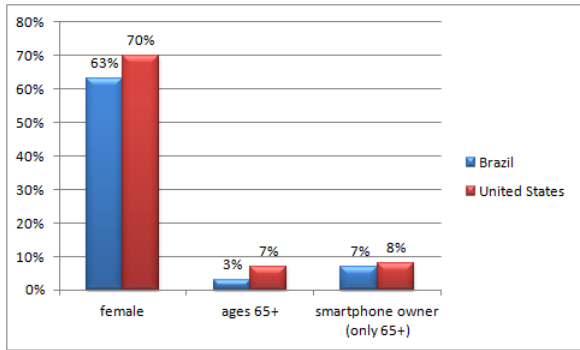


Figure 3 - Comparison of the results

III. IDENTIFICATION AND DEFINITION OF PERSONAS

The persona is defined as a fictional character, a hypothetical model of a group of real users, created to describe a typical user [14][15]. Personas have been used as an important mechanism for the precise definition of the characteristics of potential users of a system [16]. To identify and define the personas, one must first observe the profile of the user group being studied.

In this work, we decided to use the approach proposed by Nielsen [14] for modeling and analysis of user profiles. The personas are defined primarily by their goals, determined in a successive refinement process during the investigation of the domain and the characters that are part of it.

Cooper [15] directs that instead of organizing features to accommodate all people, should design the interface for a single persona. Although personas are fictional, there are strictly defined details to represent typical users. The method of identification and preparation of personas, adapted from [14], consisted of the following steps:

- Discovery of users: Through exploratory study, the questions were answered as 'Who are the users?' and 'What do they expect from an interface?'
- Construction Hypothesis: Through the tabulation and analysis of the exploratory study, we identified groups of related users.
- Searching for patterns: Through the categorization of the data, it was verified that all groups have proposed the hypothesis of equal importance.
- Construction of personas: From the Categorization of the study group personas were prepared.

The extraction of information from the database of users was performed using datamining software open-source Weka [20]. This software is used to identification of data clusters using techniques classification, clustering and association rules. Through Weka, using the KNN classifier (K - Nearest Neighbors) it was possible to identify the user profile collected on the various characteristics, since this demand K classifier elements of the data set that are closest to this unknown element, or which have the smallest distance. For this database was used Euclidean distance.

After collecting all the data, a new challenge arose which was to transform the entire mass of data into useful information and sufficiently well structured for the creation

of personas. Thus, it is justified to use the Weka [20] which were identified by cross-checking logic of user segmentation that will define personas profiles. From the questionnaire, the preferences of interaction, economic profile, education, personal goals and practical goals were observed.

With this analysis, we reached at three personas featuring the group studied. Figures 3, 4 and 5 illustrate the personas encountered.

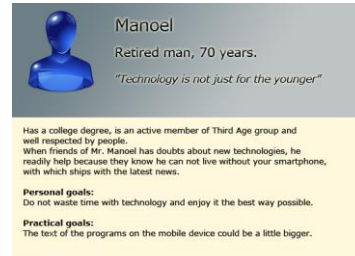


Figure 4 - Persona 1 (Manoel) obtained in the survey



Figure 5 - Persona 2 (Marina) obtained in the survey

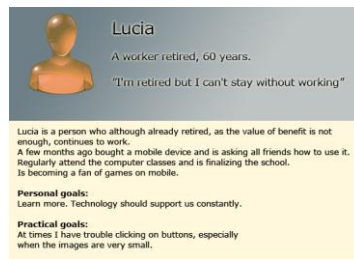


Figure 6 - Persona 3 (Lucia) obtained in the survey

Personas found from the exploratory study are quite similar to three groups identified by Gatto [17]. In his work, the author has identified five different types of personality of the elderly:

- 1) Constructive - well integrated, respected, stable, enjoying what life gives you;
- 2) Dependent - is passive, disengaged voluntarily and satisfied, sitting in a rocking chair, because, finally, can rest;
- 3) Defensive - assets, rigid, disciplined, individualistic, dedicated to many activities because he could not stand still.
- 4) Choleric - blame the world and people for their personal failures, has little ambition for the future, social and economic standards unstable precarious; fight against the manifestations of aging;
- 5) Pessimistic - shows steady decrease in socioeconomic status and no history of life, hates himself, is depressed and isolated and often exaggerate their lack of physical and psychological training, becoming a victim. Accepted the sad

old age, but has death as its release this unsatisfactory existence.

The first three types (Constructive, Defensive and Dependent), each in their different lifestyle and worldview, have adapted successfully to the aging process. On the other hand, the last two types (Choleric and Pessimist) did not fit the aging [17].

Table 3 shows who represent these personas.

TABLE III. MAPPING OF PERSONAS RAISED

Persona	Scholarity	New Interactions
Manoel	Graduated	Texts of the programs may be higher
Marina	Basic Education	Afraid to use a cell
Lucia	High School	Images may be higher

From Table 3, three very different profiles personas should be considered in the development of interfaces for mobile devices. The persona has Manoel higher level, there is great difficulty in the operationalization of mobile devices, but due to his age, he has some discomfort in reading texts; since, he considers that the font size could be larger. The Lucia persona is the typical user of seniors who are having their first contact with the technology and uses the mobile device as well as a platform for fun. Already persona Marina is a user who should have special attention from the development team of new interfaces, because, as she has strong reluctance with the technology of mobile devices, any negative experience with the interface can get her to give up time to have this contact.

Another step in the construction of personas according to Nielsen [14] is validating personas created. The characteristic of this work, this activity was not performed, nor were inserted pictures of real people in the personas created as proposed by Nielsen [14] in order to protect copyright of the photographer and the photographed person.

IV. CONCLUSION

This article aimed at studying users of mobile devices for the elderly in Brazil. Thus, the results represent trends, experiences and behavior patterns associated only with the study group. The cultural, religious, political, technical, can not be determined by the number of subjects studied. However, research can be considered as an initial study to help understand the use of mobile devices by users seniors and opportunities for future research, development or adaptation in the software specific for this group, since the software must serve the needs users [18] [19].

From this study, it is clear that an application of global reach such as social networks or solutions of e-commerce cannot consider, for example, only users of a certain age, because the interests and needs of each band is totally different, as was found in accordance with the personas raised.

The research showed that, beyond the limitations of motor, cognitive or perceptual common users of old age, there are other obstacles in the use of mobile devices in the

user group of seniors. The difficulty in performing operations theoretically simple as reading a text or click a picture, suggest the need for targeted approaches to the public studied.

Thus, it is concluded that the need to understand how the techniques and methodologies aimed at IHC group of seniors can help to understand the real needs of this group of users, the social aspects and experience with technology users can interfere with successful acceptance of new software or technology.

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