

Research on Interaction Design of Intelligent Mobile Phone for the Elderly Based on the User Experience

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Abstract. Whether in the developed or developing countries, aging of population has been a common global trend. With the development of the communication technology and the Internet era of prosperity, the elderly people also inevitably need to use modern communication products such as mobile phone so that they could keep contact with their family, children, the outside world, including quick call in case of an emergency etc. But the physiology and psychology of the elderly are very different from the young people, which mainly is reflected in the degradation of vision, hearing, touch, reaction ability, hand strength, text and graphics memory ability and so on. Thus when the elderly people are using the mobile phone there are a lot of inconvenience and special requirements by them and the user experience is also far different from the other age groups. Therefore, in the design of the mobile phone for the older age groups whether the appearance design or the interaction design should reflect on our care for this special group, to improve the usability of the product, to bring convenience for them. This paper firstly studies the physiological and psychological characteristics of the elderly. Then it analyses the behavior characteristics of the elderly in the use of mobile phone and the user experience. Moreover some principles and methods of interaction design for the elderly mobile phone are presented in this essay; Additionally through several practical cases of the mobile phone design for the elderly in China and by using the research method such as the user behavior analysis, user survey, Analysis of the availability of products, product evaluation, this paper will analyze and summarize the shortcomings of the current mobile phone for the elderly in interaction design. Finally this paper will not only point out the direction of improvement for the elderly mobile interaction design but also provide some useful suggestions and enlightenment for the elderly mobile phone design in the future.

Keywords: Interaction design · The elderly mobile phone · User experience

1 Introduction

The application and development of digitizing have made new demands to mobile phone interaction design and other fields constantly. Mobile phone has become a smart media tool which help people communicate with others release news and express

personal views in 21st century when it was a kind of ordinary communication tool in the late 20th century. In one hand, Phone as a new media into our lives, it has both information dissemination functions, but also has editing functions of information, its function determines the phone has a very wide range of user groups. In the other hand, with the advent of the era of Chinese society aging, older products, particularly growing demand for mobile phones. How to use information technology to improve the quality of life of older persons to researchers, developers, community managers, market players are needed to solve a problem, it has both a large market potential and economic significance, but also has great social significance and cultural value.

2012 is the Chinese smart-phone outbreak, the use of smart phones have entered the vast majority of Chinese families. Smart-phone is the use of touch-screen technology, the technology is applied to a type of mobile phone handset screen above. The greatest feature is its large screen that you can make to bring visual enjoyment, whether text or images from aspects reflect the characteristics of the big screen. There are currently a lot of smart phones on the market, but it is not suitable for the elderly, through surveys and studies have found that older user experience research has been at a relatively low level. Currently, there are many shortcomings for older smart-phones. Relatively small, such as font, icon is relatively small, there is a complex operation, for main-stream IOS and Android operating systems, elderly or inconvenient to use. Therefore, upgrading older smart-phone interaction design is very important.

This paper focuses on the interaction design of smart phones for the elderly, based on a sense of how to improve the experience of interacting with older smart-phones. To sum up, the paper work and the main results obtained are as follows: 1. based on the relevant literature to define the user experience, interaction design, older smart-phone concept. 2. through research and analysis in the form of user interviews and questionnaires, the results of the interaction of many factors that affect the elderly smart phone design, and described from four users, behavior, technology and scenes. 3. the older design of the smart-phone user experience is divided into three layers, namely, the experience level of human caring, emotional care experience level, transcendent experience level, and targeted research on the characteristics of these three experiences. 4. finally, discusses the strategies and recommendations to enhance the older smart-phone interaction design.

In this paper, the elderly smart-phone for the study, theoretically designed to enrich the user experience as the core of the interaction de-sign study for the integration of technology and art filled with more possibilities bridge erected in practice to businesses and designers to provide a reference.

2 Research Background

With the improvement of people's health and life expectancy of the population, the elderly account for a growing proportion of the population in China in recent years, the concept of healthy aging in-creasing attention from the international community. The United Nations, the healthy aging as a global goal to address aging issues.

International definition of the elderly are not uniform, usually 60 or 65 years of age or older citizens regarded. By the end of 2011, the Chinese elderly population aged 60

and above has reached 185 million people, 13.7 percent of the total population. A longer period of time in the future, the proportion of the elderly population will average 3.2 % growth rate in 2020, the elderly population will reach 248 million, the level of aging will reach 17.17 %, of which, 80 years old and older population will reach 3067 million, accounting for 12.37 % of the elderly population.

At present, China's number of mobile subscribers has more than 960 million, of which smart mobile terminal growth trend showing violent. Chinese smart phone users accounted for 33.9 % share of the global smart phone, smart phone users in China the proportion of people over the age of 45 and gradually increased, as of the end of March 2013, this group accounted for 7.1 %, up 3.5 percentage points higher than the end of 2011. The absolute number of elderly Chinese smart-phones are weak, although in all age groups, but its growth rate is impressive.

According to the middle-aged group of professional survey results reflect, in which the middle-aged group, 60-year-old former people, 85.59 % have a mobile phone, but 62.38 % over a two-year service life; parents of children with a cell phone from 52.25 %, which a large part of the children out of product, 45.38 % of respondents intend to replace parents/buy mobile phones; nearly 69 percent of people think that there is little old mobile phones on the market, so the 67.8 % of the elderly welcomed the phone; the main product information Get through the Internet, 48.48 %, 43.94 % is searching through the store; 70.37 per-cent choose to purchase traditional stores, selected by the network to buy 19.75 %, 9.26 % choose phone orders only.

Looking at the current mobile phone market, although many varieties, but the use of smart phones for the elderly, but very few. At pre-sent, the smart phone market also belong to the elderly incubation period, the low-end market is mainly dominated by older machines, old ordinary phone call can solve the basic needs of the elderly, but can not meet the fashion of the elderly for health, recreation and social demand, smart-phones complex operation, is still the biggest obstacles to the elderly to use.

Due to the aging of bodily functions and the consequent changes in mental aging makes use of smart phones for the elderly constitute a significant obstacle. Due to the aging of the body, slowing the elderly brain reaction speed, sensory organs and organ function decline movement, so they fall on the ability to learn new things, reduced ability to coordinate action, seeing and hearing decline. Overall, the obstacles Chinese elderly smart-phone include: physical, mental, skills, services and economic barriers. Mainly in the following areas: Content smart-phone display text, especially for the elderly seem difficult; smart phone operating mode for the elderly is not very applicable; realize the functions of the smart phone is not intuitive, but to go through learning. In summary, the barriers older people use smart phones mainly on smart-phones and human interaction, to overcome these obstacles, we must take into account the common characteristics of older users, starting from the interactive mode, based on user experience design ideas applied to interaction design for smart phones in. Therefore, from the perspective of the user experience, based on the behavior of the elderly and psychological research, as well as the basis for understanding the context of the elderly to use, to explore the experience of older smart-phone design factors conducive to design a truly meet the elderly are particularly smart-phones important.

3 Literature Review

User experience is the user in the use of a product or a service in an interview, with their own experience built up a feeling both physical and psychological, including.

Field of study abroad in the elderly mobile phone user experience interaction design focused on appearance, function, development and usability, and more and more attention and depth. For example, Sanches Lam (2009) used a variety of methods to confirm the elderly have to use smart phones for learning needs and interests. British Sri Kurniawan (2006) study found that mobile phone design through face problems in the elderly, as well as suitable for the elderly phone “good interface” with the characteristics. Malaysia Hazrina Hassan, Mohd Hairul Nizam Md Nasir (2008) study in the elderly mobile phones mainly in older handsets look and functional design. Wonkyu Park (2011) propose a systematic methodology to derive broad design guidelines for mobile user interfaces, and verified through a case study of the method are summarized in three key factors derived using the method that the general usability criteria, the user interface components and the development of principles and guidelines attributes, user interface designers this method can be used to develop and improve the standard and standard phone interface. Karen Renaud and Judy made in the elderly mobile phone handset design, attention should shortcuts design, streamline operations, user-centric. Hartmut Wandke and Lucienne Blessing designed a set of experiments designed the 42 non-contact interaction actions were a certain number of elderly and young people compared comparison found complete accuracy of these actions elderly and young people and there is not much difference, which is slower than on the completion of young people.

Chinese elderly mobile phone interaction design is still in its infancy. Yang Jingjing (2008) to the elderly mobile phone design, for example, a mobile phone for the elderly and attitude survey of existing multi-function mobile phones is reasonable analysis. Wu Xia, Wu Chao (2009) using the ergonomic and cognitive psychology theory, a design approach to the elderly as the center of the man-machine interface, and make the phone better services for the elderly, people and machines real match. Zhou Yu, Dong Jixian (2009), Yang Yakun (2013) for the multi-functional mobile phones currently on the market phenomenon, the modular design method is introduced to solve the elderly handset design capabilities waste, pointing out the necessity of product function properly designed. User research Peng Jia (2013) to the elderly smart-phone APP interaction design interface for the study, health aides APP interface design, for example, confirmed that the interface design process should always carry out the user experience-oriented, not only have a thorough preliminary design profound insight into the needs of users, the latter should also be repeated user testing. Sun since Tudor (2014) believes that the smart-phone complex operation, is still the biggest factor impeding the elderly to use in intelligence, we should be simplified for the physiological characteristics of the elderly, operating practices, so that the elderly will be able to learn to use short, manufacturers need to overcome the problem.

In summary, the present study abroad interaction design more mature, smart phones for the study of interaction design practice focused, practice and technology development, but there are still problems, interaction design research for the theory to a

third-party application design guide books still less. There are currently no systematic a good way to help the elderly mobile phone designers to design development and evaluation, theoretical and applied research on older mobile phones to interact intelligently designed room for improvement there.

4 Research Methods

4.1 The Main Research Methods of this Paper

The first one is the multidisciplinary research method. The content framework of this paper uses interdisciplinary knowledge system interaction design to construct the elderly intelligent mobile phone, enriches the connotation and direction for the traditional interface design. First of all, by using the knowledge of user psychology analysis of hierarchy of needs, the application needs to try to satisfy higher level of the hierarchy of needs to make the user to generate sustained and strong point of application; secondly, try to concept study of the elderly interaction design in intelligent mobile phone using psychology, aesthetics, art design.

The second one is the research method of literature. This paper studies the translation and collected books related to mobile internet interaction design and old product design and design aesthetics, psychology and information, research for the elderly intelligent mobile phone interaction design content, method, characteristic, sorted out and analyzed; the contents of each part system adopts the inductive method for the elderly intelligent mobile phone interaction design re organization; at the same time, through the comparison and analysis of literature, obtains the product user centered design methods, should be closely combined with the analysis of market environment and competitive factors, choose more paths and methods suitable for the elderly intelligent mobile phone interaction design.

The third is to study the method of model. Through analyzing the user needs of the elderly level relationship between the induction intelligent mobile phone applications, the research proposes the user cognition, behavior and emotion model, and emphasizes the designer models need to be as much as possible match the user model, so as to make the application in accordance with the user's psychological expectations.

4.2 The Specific Research Method in this Paper

The first is the user observation and interview method. According to the basic information of the user and a mobile phone with health related topics, user interview, observation method combined with observation of user behavior, to existing products operation, confusion and problems encountered in the process of using record, analyze user cognitive model, behavior habit and other elements.

The second is the qualitative and quantitative research method. Qualitative research is mainly user interview, quantitative research is mainly a questionnaire survey method.

The third is the personas method. According to the interview and questionnaire survey results, user goal definition, including the target task, mental model and behavior pattern.

The fourth is the objective oriented method. In determining the older users put forward the promotion strategy and suggestions on the basis of intelligent mobile phone demand, interaction design, information including hardware and software interaction design and interactive experience design.

5 Result

5.1 Research on the Influence Factors of the Elderly in Intelligent Mobile Phone Interaction Design

The elderly is the target user of the study, they are exactly different from the young in physical, mental health and behavior. So in order to design intelligent mobile phone conforms to the characteristics of the elderly, we must understand the differences between them and the young people first. This difference is one of the key to solve the elder's difficulty in learning using intelligent mobile phone.

The main effect of design of the intelligent mobile phone interaction is the user, behavior, technology, environment and other factors.

User impact factors. Changes in physiology of the elderly is mainly reflected in its perception system. For example, physiological changes in the elderly in the visual aspects mainly: presbyopia, color change, physiological Ming and dark vision changes, the decrease of contrast sensitivity, glare sensitivity of vision and depth perception, smaller weakened etc.

The behavior influence factor. The old man's hand is the most important part for the operation of the mobile phone, but the hand of each joint with age aging gradually become rigid, inflexible, maybe even a trembling.

Technical factors. The elder people is lack of knowledge of science and technology, they do not quite understand some of the application and proper nouns in the language to describe the function, in the process of using intelligent mobile phone will usually appear confusion, frustration.

Scene influence factors. When the aged used interactive scene changes, elder people may feel unable to adapt to the changes, and even affect the use of mobile phone.

5.2 The Elderly Intelligent Mobile Phone Interaction Design User Experience Level Model Construction

Interaction design of mobile phone is mainly to solve the interaction process and information architecture and design, including menu design, hardware interface definitions and interactive design documentation. The author will be elderly intelligent mobile phone interactive user experience design experience, emotion experience, care for humanity transcending experience level model.

The first human caring experience level. On the basic of interaction design principles, intelligent mobile phone for the elderly to humanity is: simplicity, respect, friendly user feedback, consistency. One is simple. Interactive design of the elderly a smart phone interface: no need to learn, one will see two seconds of wait time,

operating within step three. The two is to respect the user. In the real life of common element applied to the elderly the Smart phone application interface design. Three is the friendly feedback. To provide the elderly immediate and positive feedback, according to different circumstances difference design. Four is the consistency. Consistent visual, elderly intelligent mobile phone function, information architecture, operation mode. For example: the expression of interface function should also try to match the elderly cultural knowledge, so that the elderly can quickly understand and operate.

Beyond the experience level again. After investigation and analysis, the characteristics of intelligent mobile phone that older users is one of the most critical is the personification of remote interactive, intelligent, caring. The first one is personification. For natural interaction through language, gestures, facial expressions, gaze and body language. The second one is the remote interaction. With the intelligent mobile phone based mobile intelligent terminal, in a whole new way to interact. The third one is the smart care. Through the intelligent mobile phone positioning real-time understanding of the position of the elderly and health.

5.3 Elderly Smart-Phone Interaction Design and Recommend Strategies to Enhance

Elderly smart-phone interaction design is to allow the elderly more quickly, simply and efficiently operate the phone. On the one hand we realize the function; on the other hand we must also get pleasure visual, auditory, tactile and psychological. For example ITT Easy 5, Jitterbug Touch, Life Plus, Doro HandleEasy 330GSM, Emporia Connect, Raku Raku (F-12D), NOKIA X (RM-980), Hisense E360M, obooy EA508 elderly and other smart phones. It includes hardware and software interaction design, information design and interaction design interactive experience. Its promotion strategy and recommendations are as follows:

The interaction design of hardware is the need to pay attention to the following aspects. The first is handset size. In determining the scale of older phones, designer ergonomic reference to the definition of the best features of size: the size of the best features of the human dimension percentile = + + psychological correction function to correct the amount of volume. The sizes of the phone within $110 \times 84 \times 18$ mm, the elderly in order to meet the requirements of scale. The Second is the key size. The size of the older phone keys, thumb finger widest, according to this size, the higher the accuracy of the size of the phone keys, take fifty percentile: 21 mm. Hand of freedom has a certain range of factors in this regard attention should be designed in older phones. The last is volume. According to the previous analysis and the elderly affect the physical and psychological characteristics, when designing the sound, not only to consider whether to listen carefully to the elderly, but also need to consider the impact of the size of the sound on vision. Set the size of the sound into an adjustable mode, the maximum volume can be designed to 70 db, 70 db above may cause damage to hearing on the elderly. While ensuring clear sound clear, gentle not harsh, especially voice prompts operation, should bring clear message reminders and feedback to the elderly.

About software interaction design should pay attention to the following aspects one simple smart-phone. Have the following functions: First Call functions: designed to

loud and clear, the best talk in a noisy environment also affected the pattern. Second Ring features: ringing loud and in accordance with the elderly hobby, it is best oldies and classic drama. Third, the text input function: the key input method based, voice or handwriting supplement. Pinyin input method selection or stroke input method. Fourth Display: Screen color soft and easy to identify, soft interface font larger. The second is in the end smart-phones. In addition to these functions, but also includes the following four functions: First radio function: can receive more channels, the effect is more clear and better. Second alarm: Tone big, it is best voice broadcast to remind time and content. Third, the memo: Voice memo reminding content, such as rationing medication such matters. Fourth Call Alert: voice reminder, speed to slow, soft and clear voice. Set caller photo display. The third is about the high-end intelligent mobile phone. This phone addition to the above features, but also includes the following three functions: First, the entertainment features: Set chess and mahjong games, MP3, for old people listen to music, theater and entertainment purposes. Second, the calculator function: designed to be simple model suggested by way of handwriting input, and can deliver results fast, easy and convenient to use when computing for the elderly. Third, GPRS positioning function: to determine the location of the elderly, in time to help families find lost, lost in the elderly. Other features: health care software, physical exercise software, flashlight function.

Several aspects of information interaction design, one reasonable arrangement density information of the project. Need to design a suitable way to highlight the key information that is adjustable font and icon arrangement. Second, should use the user's language to convey information, rather than the language technology. Third, make the font size, color, icon design focus on symbolic. Fourth boot animation, consistent detail and intangible elements of the framework. Fifth avoid the same element that contains too much information.

On improving the experience of interaction design has the following strategies and suggestions. First let older users control interactive process, "Next", "Finish" button. Secondly, Interactive experience de-signs to have a certain commonality and intelligence, to help or hints for older users operating role. Third icons, multimedia design, detail design and additional features designed for older users to experience the value, effectively enhance the experience degrees. Fourth visual design, for example, switch machine animation, interface display effects. Fifth older users consider the privacy of information, providing effective protection mechanisms, such as a fingerprint to unlock, unlock graphics, digital unlocking.

6 Conclusions and Discussion

Elderly smart-phone user experience based on interaction design is to design user-desired goal, to meet user demand for the product of emotional experience.

Elderly smart-phone interaction design focuses on simplicity, simple interface, easy to identify with buttons to ensure older people can be spotted in any case to see stability.

Emotional experience of the elderly should be based on its function, given the emotional content of products, and through the "form of love," allowing users to feel a

certain emotional satisfaction. “Emotion-ally moving” is the key to emotional experience, the taste of the appearance, intimate functions, is the key to enhance the emotional experience of older smart-phone design.

Elderly smart-phone is necessary to meet the child needs for care and love their parents, but also realize the emotional communication between parents and children, especially in the strong emotional appeal when parents participate in patency between the old and the phone, the phone with their children, is very important.

Elderly smart-phone design study investigated sensory effects not only the elderly, but also to fully relate to a specific mobile application interaction processes, and other aspects of experience, complete mobile Internet ecosystem is intelligent hardware, operating systems and third-party applications the composition, of a portion of the adverse experience will affect the user experience across the elderly.

In short, the elderly smart-phone user experience, interaction de-sign, based on the requirements in the design is closely integrated with the elderly, the elderly needed attention, understanding the elderly emotion. For the elderly in order to meet the basic requirements on product functionality, interactivity and focus on the emotional experience of the elderly to the technical support, the closer to the man-machine from design better and more humane interaction works.

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