

The Analysis and Research of the Smart Phone's User Interface Based on Chinese Elderly's Cognitive Character

Delai Men, Dong Wang, and Xiaoping Hu*

School of Design, South China University of Technology
Guangzhou Higher Education Mega Centre, Panyu District, Guangzhou, P.R. China, 510006
huxp@scut.edu.cn

Abstract. With the rapid development of modern information era, smart phones have become an irreversible trend to replace the tradition ones. With the trend of aging population in China, we can't underestimate the rapidly growing population of the Chinese elderly people and increasingly demanding for smart phone. The UI, which is short for user interface, is referred to the collection of interactive methods between phone users and interior phones system. And the research on UI is becoming more and more important in the research of smart phone. By doing the survey which combined the elderly's cognition with the smart phones' UI design, the thesis is aimed at acquiring the methods of UI design for elderly people so that the smart phones can conform to them better. In this way, the smart phones' functions can be totally applied to them and elderly people's vision enjoyment can be improved.

Keywords: Elderly people, User interface, Smart phone, Design method, Elderly's cognition.

1 Introduction and Background

1.1 The Trend of Aging Population

There is growing aging phenomenon with the rise of aging population throughout the world. According to the World Health Organization [1], all across Asia, the number of people who is age of 65 and above is expected to increase dramatically over the next 50 years. For this region, the population of this age group will increase by 314 percent—from 207 million in 2000 to 857 million in 2050. What should we do in face of the aging century? These issues are also being confronted in the West where population aging is more advanced. But the process of population aging is much more rapidly in Asia than Western countries, and it will occur in some Asian countries in the earlier development of their economies.

* Corresponding author.

For about two decades of speculation and anticipation, aging population has finally arrived with a demographic and social reality in China. Two and a half decades ago, when we started to pay attention to the aging population in early days, China's population aged 60 and above was only 7.6 percent, and those aged 65 and above constituted only 4.9 percent of the total population [2]. In 2005, more than 140 million people in China are 60 years or older, a population size that exceeds the total population of Japan, and approximately the same as the total population of Bangladesh or Russia [3]. What is more, as aging population continues, we can't underestimate it.

1.2 The Trend of Smart Phones in China

Based on the latest data published by the global technology research and consulting company Gartner, the whole smart phone sales of 2013 is 968 million which had a increase of 42.3 percent by the last year. And it's the first time that smart phone have exceed the unsmart phones that the smart phone has the 53.6% sales in the whole sale volume of mobile phone. China has the distinct contribution on the smart phone selling with the fast increasing rate by 86.3% in 2013. Because the Chinese elderly has the low utilization on smart phone, it will have an enormous potential market.

1.3 The Specialties of the Elderly People When Using Smart Phone

Due to their aging, many elderly people suffer from the declination of cognitive, motor and physical abilities. Many of them experience difficulties using certain features when interacting with their mobile phones, especially technology of shifting from keypad to touch-screen mobile user interfaces.

2 Methods

2.1 Determining the Target People of the Study

The research is only focus on the permanent residents in China who's age is between 60 and 90 years old. And it's available whether they have smart or not. The sample contains 50 elderly people which come from different provinces in the north China, east China and south China. Because of the low density of elderly people and the distance barriers, the elderly people in the west China is out of the survey.

2.2 Card Testing

This study was to determine the operating acceptability, the cognitive preferences and the consumer demands of the smart phones' UI for people older than 60 years; some testing card were prepared for this propose. Then the final testing card was formed after some necessary modification.

The testing cards contain five parts. The first part is the general information of the audience and the second part is the detailed content of their mobile phone. The third

part is about their operation acceptability of the smart phones' UI and the forth part is aimed at analyzing the cognitive preference of the UI with different color, structure or visual effect, etc. The fifth part of the testing is to get the core consuming factors of the elderly when choosing the smart phone.

2.3 Data Analysis

The data was collected and the SPSS software was used to analyze the frequency distribution.

3 Literature Review and Related Research Work

3.1 The Lack of Survey of Elderly People

The design process of smart phone interface runs through four basic interactive design processes: identifying the Target User Group, defying 3D UI Context, building interface Prototype, and evaluating [4]. But there are no talent companies concentrated on the Chinese elderly people in China and all the best-selling smart phones and the UI are created for the young people who have the enormous consuming power. So the research on the Chinese elderly people is very little.

Therefore, we can no more underestimate the rapidly growing population of the Chinese elderly people and their growing need of smart phone.

3.2 The Importance of Smart Phone's UI for the Chinese Elderly

As one of the most important elements of smart phone functions, UI determines the comfort level when people use the smart phone and the enjoyment when they watch it. It can not only improve the phone operability but also ease users' memory pressure. Some elders especially the new generation have become the users of smart phone, accounting for their special cognition, there exists quite differences from the general individuals as for the elders' using customs and cognitive styles. Although the global aging problem has become more and more remarkable, the research on elderly people's smart phone is still in the initial stages. Besides, few people pay attention to the research of their smart phones' UI.

3.3 The Aim of This Paper

The aim of this paper is to get the acceptability and the preference of different smart phone's UI for the Chinese elderly people through the investigation by using the card testing and questionnaire. Then we'll analyze the demographic, the elderly people's information of their mobile phone, the cognitive preference of the elderly people and their demands after the investigation. In the end of this paper, we can conclude the main principles when designing the smart phone's UI for the Chinese elderly people.

3.4 Related Work

The Japanese Company Fujitsu have created one famous smart phone “Raku Raku”, which is made for the elderly. The Raku Raku – which means "comfortable" or "easy" in Japanese – comes with large app icons and text, and can even slow down a caller's voice so that they can be understood better [5]. Though it's design for the elderly, its interface is very colorful and it uses the Android 4.0 Ice Cream Sandwich system which is very young. And it eventually gets the Considerable income.

Apple Inc supposed their products just like iPhone and iPad were designed for the consumer aged from “one to 100”. It just across the youth demographic and are age friendly products. iPhone has the easy interface which is very harmony and its visual effect is very enjoyable. But in China not every elderly people can afford the iPhone and it does not suits every elderly people as the icons are too complex to them.

Most smart phones on the market, however, use Google's Android OS. Because Android is to some extent open source, however, individual phone handsets have different versions of the interface. The interface is very multiple and garish and it's not easy to handle it. Windows Phone has taken great strides, and although the interface is flashy and full of bright colors, it is the simplest mobile operating system to users [6].

The Samsung Company was going to make one smart phone targeted towards the elderly and the disabled. The functions are very useful for the elderly people, but the specific of the UI is rarely mentioned.

4 Results

4.1 Demographic

The demographic of the survey contained two value of number: number of persons/percentage in this paper.

The sexual distinction, the age level, the education background and the income of per month of the 55 elderly people who have been investigated was shown in Table 1.

Table 1. The information of the elderly

	Categories	F	%
Sex	Male	24	43.6%
	Female	31	56.4%
The age level	60-70	37	67.3%
	70-80	18	32.7%
The Education Background	Primary School	17	30.9%
	High School	32	58.2%
	Undergraduate	6	10.9%
The income/month	Below 1000 RMB	1	1.8%
	1000 RMB-2000 RMB	37	67.3%
	2000 RMB-3000 RMB	15	27.3%
	3000 RMB-5000 RMB	2	3.6%

4.2 The Information of Their Mobile Phone

The information of their mobile phone was determined by the questionnaire and the results are showed in the Table 2. It mainly subscribes the section of their phones' price and the purchase channel.

Table 2. The information of their using mobile phone

	Categories	F	%
Brand	Apple	5	9.1%
	Samsung	22	40%
	Nokia	19	34.5%
	Other	9	16.4%
Mobile Phones' Price	0-500 RMB	19	34.5%
	500 RMB-1000 RMB	17	30.9%
	1000 RMB-2000 RMB	6	10.9%
	2000 RMB-3000 RMB	5	9.1%
	Above 3000 RMB	8	14.5%
The Approach to Get the Mobile Phone	Bought by themself	12	21.8%
	Bought by their children	43	78.2%

4.3 The Elderly's Cognitive Preference

The elderly's cognitive preference of their mobile phone was got by the Card Testing and the results are shown in the Table 3. It contained the preference of composition, style and color, and different kinds of smart phones have been tested of its color.

Table 3. The elderly's Cognitive Preference

	Categories	F	%
Screen Lock	Pass word	9	16.4%
	Four directions slide	15	27.3%
	Long press the middle key	7	12.7%
	Just slide switch	24	43.6%
Composition	Horizontal composition	5	9.1%
	Vertical composition	31	56.4%
	It does not matter	19	34.5%
Interface Composition of Main Page	ISO	20	36.4%
	Android	9	16.4%
	Windows 8	17	30.9%
	Other	9	16.4%
Interface of Messaging	ISO	23	41.8%
	Android	8	14.5%
	Windows 8	17	30.9%
	Other	7	12.7%

Table 3. (continued)

Interface of Dialing	ISO	8	14.5%
	Android	16	29.1%
	Windows 8	29	52.7%
	Other	3	5.5%
Interface of Social Software	Facebook	41	74.5%
	WeChat	2	3.6%
	QQ	9	16.4%
	Sina Microblog	3	5.5%
The Tonality of Main Page	Light coffee	17	30.9%
	Green	4	7.3%
	Orange	15	27.3%
	Ocean blue	3	5.5%
	Purple	5	9.1%
	Yellow	1	1.8%
	Red	4	7.3%
	Brown	6	10.9%

4.4 The Elderly's Demands and Needs

The elderly's demands and needs of their mobile phone was got by the questionnaire and the results are shown in the Table 4.

Table 4. The elderly's demands

	Categories	F	%
The Influence by UI	Obvious	34	61.8%
	Un-obvious	21	38.2%
Change the UI Frequently	Yes	13	23.6%
	No	42	76.4%
The Ideal UI's Style in the Future	Scientific	2	3.6%
	Brief & Simple	49	89.1%
	Interesting	4	7.3%
	Fashion	0	0%
The Central of Smart Phone's UI	Harmony	18	32.7%
	High deficiency execution	21	38.2%
	Conform to your visual habits	12	21.8%
	Visual enjoyment	4	7.3%

5 Discussion

5.1 Demographic

Through the results of the demographic, we can find that the female is more than male, it's mainly because the lifespan of Chinese female is longer than Chinese male.

The education background results can tell us that the Chinese elderly people have the low degree of education for only 10.9% people are undergraduate. Most of their income is between 1000 RMB/month to 3000 RMB/month, and the income between 1000 RMB-2000 RMB owns 67.3% of all the subjects. So it determines the consuming power is enough to buy smart phones and it's a large market based on the huge population of elderly in China.

5.2 The Information of Their Mobile Phone

Through the brand using data, we can find that the Samsung has the maximum users with 40% and Nokia still have the 34.5% of users though Nokia has the little brand share in the whole market of China. The updating speed of elderly's mobile phone update speed is much slower than the youth and the middle-aged people. 34.5% of the mobile phone is 0-500 RMB and 30.9% of the mobile phone is 500-1000 RMB. So their mobile phones' price is a little low relatively but it does not mean there is no market prospect on the elderly for there's still 24.5% people whose mobile phone is above 1000 RMB. Considering the approach of getting the mobile phone, we can conclude that the main purpose they get the mobile phone is for their children. So the update rate of their mobile phone is sometimes depending on the youth and the middle-aged people and the elderly people is passive on the choosing of their smart phones.

5.3 The Elderly's Cognitive Preference

The "just slide switch" get the 43.6% and the "pass word" only get 16.4% indicated that the elderly didn't like to make the screen lock too complex to enter the main page. The 56.4% elderly choose the vertical composition and 34.5% elderly has no sense of this difference. The main page of ISO 7 gets the maximum number of 36.4% and then followed the interface of windows 8 with the number of 30.9%. At the interface of messaging, ISO 7 also gets the maximum number 41.8%. And Windows 8 with the 30.9% of the elderly is followed. We can get that the ISO 7's and Windows 8's optical design is very useful for the special group. At the interface of dialing, 52.7% elderly people choose the Windows 8 and this number is much higher than other ones. The Windows 8's dialing interface is very simply which only has the number, some simply boxes and the number field. We can indicated that the elderly need simply operation more than visual effect when they meet the mobile phone's functional interface they use frequently.

We put four kinds of social software in the Card Testing which the style and composition is very different from the other ones. The interesting thing is that the Facebook's interface get the maximum number 74.5% in spite they have never used this software for it's not feasible in mainland China. The reason why they choose Facebook is that they thought the Facebook's main interface structure is still the same as their mobile phone's and it's very direct and clearly, but the other ones is not the same

and they should take more time to learn from it. We can indicated that they have used to the interface structure of they used before and their thoughts have been fixed and they don't want to change it. The tonality of the main page is tested by the smart phone with one main hue. Most of the elderly people like the light coffee and orange. It shows that the Chinese elderly people who like the bright and brisk color will be fond of orange and they like the gentle color will like the color light coffee.

5.4 The Elderly's Demands

Through the data of the survey, we can find that above one half of the elderly care about the mobile phones' UI. Only 23.6% elderly people want to change the UI frequently and on the contrary 76.4% elderly does not. So the elderly need one stable UI so that he can drive well. Of 89.1% elderly people's ideal UI are brief & simply ones, it indicated that they want their mobile phone more simply than present. And 38.2% elderly people think the central of smart phone's UI is high efficiency execution and 32.7% think harmony is the central. Only 7.3% elderly people think the visual enjoyment is the central of the smart phone's UI. So we can conclude that the Chinese elderly have no sense of the enjoying play of the smart phone and they are very practical.

6 Conclusions

After the analysis of the results and the discussion, we can find the elderly people's characteristics when using their mobile phone and the principles when design the UI for them. Though the research, we can conclude that:

- 1) The education background results can tell us that the Chinese elderly people have the low degree of education, so the interface should use simply words and compositions.
- 2) Although the Chinese elderly's mobile phone is mainly below 1000 RMB, there is still enormous potential market based on the population of China elderly.
- 3) The interface designed for the elderly should keep connect with the previous mobile phone which is mainly used by the elderly people, and it's better to use the same UI structure so they can operate the smart phones smoothly.
- 4) The smart phones' screen lock should not be too complex and it's not good to set the pass word as the screen lock.
- 5) The interface of smart phone can be more brief and simple in the future.
- 6) The UI design for Chinese elderly people should remain stable.

Acknowledgment. The project supported by Guangdong Natural Science Foundation under the Grant No.: S2012010008234, and Institution of Higher Education Internal Foundation for Humanities and Social Science Research Project under the Grant No.: x2sjN8130350.

References

1. World Health Organization: Active Aging: A Policy Framework (2002), <http://www.who.int/aging/publications/active/en/index.html>
2. Banister, J.: Implications of the Aging of China's Population. In: Poston, D., Yaukey, D. (eds.) *The Population of Modern China*, pp. 463–490. Plenum Press, New York (1992)
3. Feng, W., Mason, A.: Population aging in China: Challenges, opportunities, and institutions. In: *Transition and Challenge: China's Population at the Beginning of the 21st Century*, pp. 177–196 (2007)
4. Preece, J.: Yvonne Rogers and Helen Sharp. *Interaction design beyond human-computer interaction*, pp. 119–120. John Wiley & Sons, Inc. (2002)
5. Smart-phones struggle to connect with the elderly, <http://www.cnbc.com/id/101045757/>
6. Smart-phone for the elderly: buying advice, <http://www.pcadvisor.co.uk/buying-advice/mobile-phone/3371979/smartphone-for-elderly-buying-advice/>