Research on Human-Computer Interaction Design of Self-service Public Facilities for Aging

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Abstract. With the continuous improvement of the level of modernization, the public facilities that provide self-service have become more and more frequently appearing in people's life. On the basis of traditional human-computer interaction technology, the rise of multichannel human-computer interaction technology provides a pluralistic interaction mode between human and machine, and provides more choices for human-computer interaction design of self-service public facilities than before. However, the technical advancement should not be the primary term which is taken in consideration for the self-service public facilities. The purpose is to serve the public. The main features of the self-service public facilities are studied in this paper. This paper puts forward the design principle of "maximum compatibility", expounds the influence of aging social development trend on the popularization of self-service public facilities, and studies the design method of human-computer interaction to adapt to the current trend of aging.

1. Introduction

Led by science and technology, human-computer interaction achieves sustainable development, which brings endless challenges for designers. First of all, interdisciplinary characteristics of human-computer interaction design are becoming increasingly prominent, and multidisciplinary knowledge of different fields brings multiple barriers to designers; secondly, the factors of Human-Machine-Environment system influence each other and interact with each other, that the process is very complex, it is difficult to analyse the effects of multiple variables completely; thirdly, the speed of technology innovation is very fast, there is a contradiction between the advance and the applicability of human-computer interaction.

The purpose of self-service public facilities’ establishment is to serve people, to make people satisfaction in a fluid way of interaction, and to achieve their goals. It's the ultimate goal of human-machine interaction design for self-service public facilities. The eyes of designers can be blindfolded easily by high-tech. Designers who call for advanced technology, have always put the cool experience into their design. They have ignored the original intention of human-computer interaction. Of course, it is very nice to experience so cool in Science and Technology Museum or exhibition hall or of some other entertainment facilities, there is no ground for blame. These aspects need such experience to stimulate the curiosity of the users and to impress the users. Our design can be beautiful and the method of interaction can be very new, but sometimes the experience can not be good.

The study of human-computer interaction is a very important process in design. The study of human-computer interaction can be divided into three categories: image research, experimental research and evaluation research.[1] The research on human-machine interaction of self-service public
facilities is quite difficult, because of the complex user base. There are different gender, age and cultural background. Even if a large number of user studies have been done, the result may still be unsatisfactory.

Therefore, the design principle of "maximum compatibility" should be followed for the self-service public facilities. The so-called "maximum compatibility" is designed to meet the needs of as many people as possible. In the design of self-service public facilities, we expect more people to achieve the purpose of service by using, rather than adopting the "average" design method to our design.

2. Aging

2.1. The trend of population aging
In the human-computer interaction design of self-service public facilities, the problem of social aging can not be ignored. The elderly are one of the disadvantaged groups in the self-service public facilities. The self-service public facilities for the elderly can best reflect the two words of "public service". Allowing more people to use is one of the criteria for judging whether a design is successful or not.

The age distribution of the three times’ census recently in China is shown in Figure 1. In 2010, the Sixth Population Census showed that 0-14 years old population accounted for 16.60%, 15-59 years old accounted for 70.14%, 60 years old and above accounted for 13.26%, of which 65 years and over accounted for 8.87%. Compared with the Fifth Population Census in 2000, the proportion of the 0-14 years old has fallen by 6.29%. The proportion of the 15-59 years old increased by 3.36%. The proportion of aged 60 and above increased by 2.93%, and the proportion of aged 65 and over increased by 1.91%. Compared with the Fourth Population Census in 1990, the proportion of the 0-14 years old dropped by 11.9%, and the proportion of aged 65 and over increased by 3.3%. [2]-[3]

![Figure 1. Figure with the age distribution of the last three census in China](image-url)

2.2. The relationship between aging and self-service public facilities
The changes in the age structure of the population in China indicate that the fertility rate in China remains low, and the aging process is gradually accelerating. By 2010, the average life-span of our country had reached 75 years old. With the rapid economic and social development, the people's living standards and medical conditions are increasing, and the life-span of the population will be further increased. The average life of China's population is expected to reach 85 years old until 2050. [4]

Aging is a worldwide problem. Although all countries are introducing policies to deal with the negative effects of aging, maybe the average age or the proportion of elderly may be lowered, but the number of elderly population will not be decreased in the future.

People born in 60s and 70s, lack of knowledge and potential to accept new things. In addition, the social situation of The Empty Nest Man and Left-behind children is becoming more and more prominent, and many old people are faced with their own participation in social activities without the help of others. Therefore, in the design of self-service public facilities, we should pay attention to the influence of aging.

In fact, more than a dozen years ago, the study of computer technology for the elderly was started more than a decade ago. In the United States, AARP's Older Wiser Wired plans to provide education for the elderly and to provide guidance for the designers. There are also many plans and research projects in the European Union that provide support for computer technology for the elderly. [5] Our country is also putting forward relevant service policies for the market of the elderly. There is a report about the research of the human factors affecting the needs of the elderly, which issued by the National Research Council on aging, in which it defines the following definitions: elderly is the gradual change of physiological and psychological functions in a different way. As the age increases, the average ability to distinguish between the visual and auditory senses decreases, while the average intensity and speed of the response are decreased. Losing at least one kind of memory function, decreasing the sense of flexibility, slowing down the speed of "stimulus encoding", and getting difficulty in obtaining complex thinking skills. As age increases, visual function, including static object discrimination, dark adaptation, adjustment ability, contrast sensitivity and indirect vision, has decreased from the average level (Czaja, 1987)[5]

Through the survey, it is found that in the current trend of aging, users are faced with the following problems in the use of self-service public facilities.

One of the problems is the fast technological innovation. In today's rapid development of science and technology, many facilities had not been accepted completely and used by most users, then they have been updated. Take a simple example. The operating interface of the self-service device is changed from the initial button to the resistive touch screen, and then to the capacitive touch screen. Products of the previous generation have not yet been fully popularized, and ones of the new generation have been in blossom everywhere. Above all, there is no difference in appearance between the resistive touch screen and the capacitive one, but the way of working is quite different from each other. The resistive touch screen works with a sense of pressure, and the capacitive one works by using the human current. But many people do not understand the difference, especially for older users, with limited technical information. As a result, people often see that someone click the screen of the self-service equipment hard all the time, but there is not any response on the interface, making it mistaken for the machine to be broken. The fact is that using a fingernail to knock on a capacitive screen will not work. Of course, many people touch the resistance screen for half a day, until the atmosphere's strength is used to wake up the screen. Though there are some tips on the interface, most of them can't play a part in short time, because users can't really understand the real meaning of the tips, especially for the elderly users, who is difficult to adapt to the high speed technology revolution.

Another problem is diversification of the self-service device. In many places, such as stations, hospitals and cinemas, there is beginning to build self-service public facilities. Because there is still no industry standard, and different designs are designed to show their design features, design presents a variety. For the users, a variety of self-service public facilities are not good for making a Classical conditioning in use. Every time you accept a public service, you have to focus on what you want to do next. The more diversified the function of the self-service public facility is, the more complex the
interaction process will be. Using a self-service device, because it is not familiar with the process, especially for the elderly users, it takes more time than young adults in order to achieve the same goal.

The last not the least problem is the disorder for interaction. The construction sites of self-service public facilities are mostly crowded places, and voice interaction is often not effective. Harsh or dark has a great influence on visual interaction. Especially for middle-aged and elderly users, the visual and hearing levels of most people will decline with aging. It is the reason that many people do not want to use self-service equipment. In the design of the human-computer interaction interface of the self-service public facilities, it is not only for the elderly, but also simple and easy to use. It is the criterion of interactive interface design.

So how do you make the "maximum compatibility" design? Since old people can't accept new things, is it possible to avoid high-tech and new-tech deliberately in the design? This recognition has gone into a misunderstanding. Although the old people have poor ability to accept new things, in fact, the old people can't accept new technology, the farther away from the new technology. The more disconnected to the times, the worse it gets. Not only bring the social service burden, but also create a sense of frustration to the heart of the old man.

3. The method
The purpose of the new interactive design for the elderly is to extract the understanding and acceptance of the old people from the new technology.

3.1. Overcoming the psychological cognition of "I do not understand"
It looks so complicated that it makes people stand there even like a clown, that is why the most people is afraid to try to use it. In the development of the society, many social problems resulted in that the elderly has become the "Empty Nest Man", the children has become the "Left-behind children", in the Empty Nester City, there are very few opportunity for the elderly to communicate with people, so they gradually lost the confidence to communicate with others, think of themselves as the social burden from cognition, and know nothing. So before the design and construction of the self-service public facilities, it is necessary to research on the potential motivation of the old people, how to inspire the elderly and how to attract them to use actively, that will help the elderly gradually overcome the psychological cognition, "I don't understand", to establish their confidence to contact with fresh things, and to improve the participation of the elderly social activities.

Studies have shown that increasing the compensatory function of the brain by stimulating of new things can prevent brain dysfunction and reduce the incidence of cognitive impairment and Alzheimer's disease in the elderly. Therefore, in the design of human-computer interaction of self-service public facilities, we should try to avoid overly deep description, which is simple and easy to understand, and is the difference between service facilities and artworks.

3.2. Building the effective operation guidance
Through investigation, an interesting discovery are often found. Standing at the head of the long queue, a person has been working on the self-service equipment for a long time, and always fails to achieve the goal, which leads to the impatience of the people behind the queue, even the sound of grievance. The operation is repeated but unsuccessfully for some reason, most of which is the failure of interactive design. The guidance of the operation does not give an effective guidance. Lucky people to complete the operation with the help of others, some people give up. The geriatric feeling of frustration is stronger than the young. How dose it succeed in building effective operation guidance? Take the self-service registration machine of the hospital as an example. There will be a department option on the front page of the self-service registration machine, and a department will be selected.

After entering the department information, there are doctors' messages. It sounds like very easy to make a choice. But why do you still have a lot of duplication?
3.2.1. To be described from the user's point of view. Doctors are familiar with human structures and medical names, but direct guidance is more effective for patients with very different cultural backgrounds. Different departments of the hospital’s setting is not exactly the same, it is hard to determine which department should the patient choice, and not as good as ask them straightly “what’s the matter with you?”. It may be easier to describe the patient's choice to be treated by a patient's perspective.

3.2.2. Priority of important information. As for the description of the doctor's information, in a limited area, it is a good choice to present the important information what people want to know most.

For example, doctors' professional direction, professional title, queuing number and cost are more concerned for patients, and resume information is not that important, such as published academic papers, honors and so on.

3.2.3. Clear the language. The "next" and "continue" are common operation guides, but such guidance is the most meaningless. For example, when a doctor has been chosen, "the next step" button has appeared. It is better to show directly"Are you sure to determine the medical treatment and pay for registration fee 10 yuan? You can scan the two-dimensional code to pay for it." Some guides like "sign in" and "sign up" are always wonders for the user. So clear the language and avoid these confused words.

3.2.4. Let the user do as little as possible. We should make full of use of the computing power and the big data system of the machine, and try to use the default items as much as possible. Users make a choice by their own, not only increases the psychological pressure of users, but also reduces the efficiency of interaction. In a word, the options provided to the user can not be ambiguous, incomprehensible, and intersecting. Such effective guidance is a successful design, and it is also the original purpose of the user experience and human-computer interaction design.

4. Summary

Human services are being replaced by self-service machines in an increasing fields, which liberates more and more labor force. It is a tendency to be unable to hold back the popularization of science and technology that machines work on the behalf of human beings, and become intelligent. There is no problem in pursuing the development of science and technology, but it is worth thinking about the "degree" of the application of science and technology in our life. What is the role of self-service machines playing in the human society of the future? How do machines participate in human social life? Is the purpose to make machines serve humans or replace humans with technology? There are many problems like this. As long as science and technology are developing continuously, human beings will not be able to avoid these problems.

Human-computer interaction usually lacks the temperature of human communication. Indifference and apathy are not what we expect. Followed the design principle of "maximum compatibility", it is in order to meet the needs of people for the premise, not designed for technology, because ultimately we hope that human machine dose not to say "Hey, do not I look great? ", but "Excuse me, what can I do for you?"

Public facilities are also different from individual goods. Social factors are considered as one of the most important studies of self-service public facilities. As the Times change, social factors will not remain the same. There is no absolute criterion for human-computer interaction, only the same purpose.

References
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