

Understanding the Real Need of the Elderly People When Using Mobile Phones

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Introduction

The demographics of the population have gradually been changed because people are getting healthier, living longer, and elderly people have become a large group in society. As modern communication has been drastically improved by the advantages of mobile phones, it is very often to see they cannot even operate the basic functions.

When mentioning about hot segments in the mobile phone market, mobiles companies tend to focus on teenagers, being early adopters of cool stuffs. Over at the other end of the spectrum, most companies and even designers mistakenly categorize elderly people into the entry-level group that only requires basic functions in hope that without changing the underlying operational concept entry-level mobiles can fulfil the need of senior citizen.

This study explored the issues from cognitive ergonomics to understand the real needs of elderly people when using mobile phones in order to reveal the problematic thoughts about senior mobile consumers.

The Problem

Most literatures discussed the usability of electronic devices for elderly users in terms of decline of physical performance and a slower reaction time. The improved physical features of these devices increased the operation performance of elderly users a great deal, and our understanding of their physical ergonomics (Zhang BeiYi, 2000; Chu JunHong, 2000). With the progress and diversity of electronic products, large size screens and handwritten devices enabled elderly users operate cell-phones effectively. While bigger buttons made navigation easier, older users actually faced a more complex problem in terms of understanding how mobile services were structured. When the interface is more complex, it's a problem if you don't already understand the concept of mobile services, such as SMS messages. Similarly, the complex hierarchy of a phone's menu increases the difficulty to navigate through a phone's functions as memory

declines, since it places a high demand on remembering a sequence of actions (Goldamn, 2002).

The Assumption

We speculated their operational misusability resulted from not only physiological performance but importantly cognitive misunderstanding. Applying mental model proposed by Johnson-Laird (1989) and Norman (1990), we hypothesized the mismatch between the user's and designer's mental models causes the hindrances of using mobile phones. The inability of elderly people to understand the fundamental concepts in mobile phones and the deterioration in cognitive capacities further exacerbated the situation.

The major purpose of this study was to establish a script of the cognitive process in which elderly users used and misused mobile phones. Basing on the discrepancies of mental models, the second was to provide guidelines for industrial designers to design appropriate mobile phones for the elderly.

Methodology

A usability test surveying the usability of mobile phone operations with the participation of elderly people was applied. Objective was to observe the mental phenomenon and cause of frustration occurrence while using mobile phones. The experimental method had been modified according to the characteristics of senior citizen and our experimental experience. The final method was based on protocol analysis and cooperated with structural interviews and coaching method in order to maximum both the quality and the quantity of our experimental data.

Protocol analysis was originally proposed by Ericsson & Simon (1993) to explore the human problem-solving process. In recent years, it has been broadly applied in usability test in human-computer interface (HCI) studies (Carroll & Mack, 1985). Subjects were required to speak out their thoughts while operating the target devices. Experimenters analyzed the utterances of their thinking aloud, protocol, to research the cognitive process. Nielsen(1993) indicated that protocol analysis was the qualitative method of usability test aiming at examining the operational problems and cognitive misunderstanding. The richness of protocol was valuable to the understanding of HCI (Staggers & Norcio, 1993).

Structural interviews were applied in the process of protocol experiments to encourage subjects to verbally express their thinking processes. The reason was not to direct the subjects' reaction but to guide them to express their thoughts externally. This kind of interviews was more like asking subjects questions related to HCI. This benefited in having more information from elderly people who tend not to verbally express themselves well. If the experimental process still encountered a breakdown or a standstill, coaching method was then applied (Nielsen, 1993). After the pilot test, the procedure of the experiment was established, as figure 1.

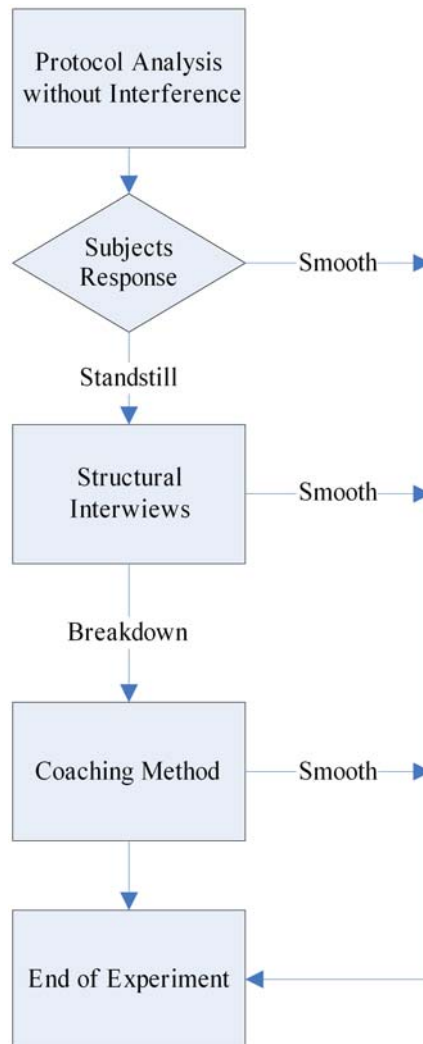


Figure 1. The procedure of experiment

The situation determining a standstill were incorrect operations for a long time and expressing of frustration, and that of a breakdown was pause for a long time and giving up. The structures of interviewing questions and coaching steps were based on Norman's execution-evaluation cycle (1990) : 1. establishing the goal, 2. forming the intention, 3. specifying the action sequence, 4. executing the action, 5. perceiving the system state, 6. interpreting the system state, 7. evaluating the system state with respect to the goals and intentions. Therefore, the first question for interview was what the goal you want to establish is and so on. If proceeding smoothly after questions or coaching, the experimental process continued with protocol analysis.

The tasks for the experiment were calling using the address book, replying the missed call, and calling an answered call again. They were the most fundamental functions of mobiles and the most essential one as well. Our target was not the differences between

mobiles phones but rather the problematic communality between them. As a result, three similar mobile phones from dominant brands were selected, including (1) NOKIA 6150. (2) Sony Ericsson T100. (3) ALCATEL OT303. In terms of the software structure of mobile phones, they possessed different operational concepts and hierarchical structures.

Each subject provided a video recording of the operational process and a concurrent protocol. The video record and transcripts were analyzed by the execution/evaluation cycle to explore the operational failure occurrence.

Results

In most literatures, elderly means an individual who will be age 60 or older by the end of the month. In reality, the definition is relatively ill-defined since it does not include the performance of physical, physiological, and psychological functions. Subjects of this study ranged from 51 to 75, having the experience of using mobile phones for 1 to 5 years. The results were presented as problematic scripts, including the detailed operational procedure, situations and discussions. Among them, common problems of mobile phones for elderly were found and described in the follows.

1. Physical characteristics and the comprehension of the icons still caused frustrations and breakdown of the operation.
2. In some of our cases, the subjects operated mobile phones using the mental model of a traditional phone. Therefore, the discrepancies between these two kinds of phones produced confusion, such as that the status of beginning in mobile phones was unclear due to the absence of sound in the traditional phone.
3. Comprehension of the meaning of the functions was essential. For example, seeing the icon of mp3 player but knowing nothing about digital music caused confusion while operating mobile phones.
4. The concept of hierarchical structure played significant roles in misconception during elderly people used mobile phones. They were dubious about the ideas of in/out and enter/back.
5. Soft keys (one key representing multiple functions according to the display) created many operational mistakes as their functions changed according to the corresponding display.
6. Some automatic wizards caused confusion during the operation.
7. Facing limited experience and knowledge of mobile phones, the elderly tend to memorize the sequence of buttons pressed without understanding of the meaning.

With our limited number of subjects, the results proposed here were preliminary and qualitative. However, the most important message of this result was the fundamental concepts applied in the design of mobile phones alienate some of the elderly users who were not familiar with any products of the digital era. In particular, soft key and hierarchy were commonly applied in the entry-level mobile phones that were proposed to be used by senior citizen. An interesting issue was that not age but the familiarity of the

underlying concepts determined the meaning of elderly in using mobile phones. Finally, the usability design guidelines of mobile phone for elderly users were proposed for industrial designers.

Discussions

For most consumers, designers, and market persons, the problems of mobile phones for the elderly were physical and external. Therefore, we could found the LG cellphone for the elderly were equipped with extra large keys, a wider size, but similar underlying functions, figure 2.



Figure 2. LG cellphone for the elderly

Our results indicated that for elderly cellphone users even with more than one year experiences misconception of basic operations and functions still existed. Therefore, the discrepancies between the users and design models hindered senior citizen to use mobile phones pleasantly.

Based on the consideration of cognitive ergonomics of the elderly, this study proposed some practical guidelines for cellphone designers, as follows.

1. The elderly are more familiar with physical operations, and thus the interactions in HCI should based more on physical characteristics to build up the system images. For example, complex use of soft keys should be avoided.
2. The levels of hierarchy should be limited to a minimum in order to be memorized easily.
3. Screen display should provide only additional and supportive information instead of indispensable one, since the elderly seldom read the visual feedback from the screen.
4. The functions of mobiles should be made gradually accessible in order to prevent unnecessary confusion of temporarily unneeded functions, such as mp3 player.

Conclusions

In conclusion, this study provided a complete method to observe the elderly while using mobile phones. Some observational results and design guidelines were provided. First, many operational problems occurred due to cognitive aspects of ergonomics. Second,

not age but the familiarity with underlying concepts of mobile phones represented the meaning of “elderly” users of cellphone. The limitation of this study was the limited number of subjects. More observations and suggestions could be proposed after the future study collects more cases. The second is the absence of the role of learning, such as user manuals.

This research contributed to a better understanding of the elder users while interacting with mobile phones. The mismatch between elderly users and design mental models produced the hindrance of using mobile phones. The problematic scripts should help inclusive industrial designers to understand the erroneous stereotypes of mobile phones and their exclusions of elderly customers. Hopefully, the myth of designers about elderly cellphone users could be demystified. The results of this study provided realistic scenarios to abridge the gap between the users and design mental models. Finally, the current technology of communication could benefit elderly people more with our better understanding of their cognitive ergonomics.

The future study will be focusing on how to facilitate the learning process when elderly people use mobile phones. Solving the problems found in this study, the user manuals accompanying the mobile phones should educate elderly users the concepts of hierarchical structure and soft keys. How to deliver the conceptual information comprehensively will be our next research direction. With the help of user manuals and better structure of software, the elderly consumers should be able to use mobile phones easily.

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