

Usability Research for the Elderly People

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Due to the aging population increase, the concern for the elderly assistances of each equipment becomes to be necessary. Steps so far taken to assist the aging population have often been limited to visual considerations, such as stronger contrasts or larger characters on the displays and printing, or such physical characteristics as the ease for pressing buttons. However, the issues associated with usability and understandability, such as their inability to understand the procedures for fund transfers on ATMs (automatic teller machines) is not unfortunately enough. Even if an elderly person is able to read the characters displayed on a screen, it is not possible for that person to use the equipment if he or she does not understand what the display means. In other words, in order to provide equipment that is easy for the elderly to use, it is important to consider not only the perceptive (senses, such as vision or hearing) and physical characteristics, but a comprehensive consideration including cognitive characteristics^{*1)} should also be taken into account.

In experimental cognitive psychology, which studies the cognitive characteristics of humans, deterioration in capacity, such as reaction time (example: Information processing speed), attention (example: Attention is influenced by the unnecessary information) and memory (example: Necessary memory capacity to perform a task), were found because of the aging. On the other hand, the kind of problems arising from the use of equipment due to these changes is still unclear.

For this reason, Oki Electric has been conducting "usability tests" (surveying the usability of equipment operations) with the participation of elderly people, for a comprehensive study of the effects of cognitive aging (changes in cognitive characteristics due to aging) and the behavioral characteristics of the elderly. Further study is ongoing to sort out the characteristics of the elderly from these results and determine the kind of considerations necessary for using the results for specific products.

This paper introduces experiments centering on usability experiments using ATMs.

Social backdrop on the problems associated with the elderly relevant to ATMs

ATMs have always been considered to be "equipment that is difficult for the elderly to use". As a matter of fact, we may have witnessed a distraught elderly person, similar to the one shown in Fig. 1. ATMs are public equipment and, an unspecified number of people use them. For this reason, ATMs must be easy to use for everyone, regardless of their age or disability. Because

the operations required by users have become much more complex and manufacturers are striving to implement a variety of improvements, with the further incorporation of multifunction operations to these pieces of equipment, such as the addition of a lottery ticket purchasing function along with existing fund transfer and deposit functions.



Fig. 1 An elderly person experiencing difficulties with an ATM

Further, there is a tendency among the elderly to use tellers rather than ATMs as if to avoid such situations. According to the "Seventh Survey of Attitudes on the Use of Financial Equipment"^{*1)}, published by the Institute for Posts and Telecommunications, one person among four (23.9%) in their 60s and one among 2.5 (43.2%) people in their 70s (refer to Fig. 2) had never used an ATM. The reasons given for this were that the "equipment operations seemed to be too difficult" (refer to Fig. 3). Of the people who responded with the reason the "equipment operation seemed to be too difficult", 38.7% were in their 50s, 43.2% were in their 60s, and for those people in their 70s the rate was more than half, at 50.3%, indicating that resistance to use the equipment rises by the higher age.

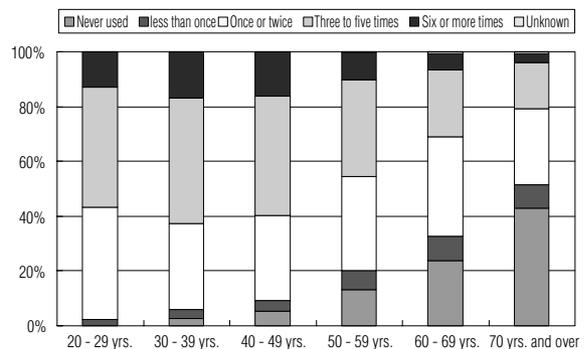


Fig. 2 ATM and CD usage rates for each age level (prepared based on information in the monthly bulletin of the Institute for Posts and Telecommunications Policy¹⁾)

*1) Improvements at Oki Electric to accommodate the elderly are not limited to "making it possible to use (accessibility) out of concern for the physical depression brought on by aging", but the additional aim is for "ease of use (usability)".

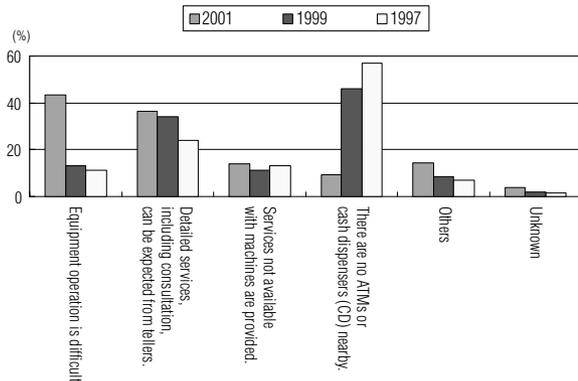


Fig. 3 Reasons for not using ATMs (prepared based on the monthly bulletin¹⁾ of the Institute for Posts and Telecommunications Policy)

Lately, many bank branches have consolidated and reduced in the total number, resulting in an increased number of locations that only provide installed ATMs. Because of this the problems are expected to be more serious, as elderly people who avoided using ATMs must be put in the situation where they have no other choice but they are forced to use ATMs.

To realize the problem by usability test

It is important to reconsider equipment in the perspective of “for those who use them” (known as a “personal view”²⁾ in technical terminology), in order to provide equipment that is easy to use for people. It is therefore necessary to understand the cognitive process, such as “in order for a user to be able to use equipment in a situation to accomplish an objective or task, how user recognize the task and what is required to accomplish the task”. An experiment known as a usability test is conducted as a method for surveying.

A usability test involves participation by ordinary users as test monitors. The users operate the equipment while a video recording of their situation is made, the data are then collected and analyzed (refer to Photo 1). The test monitors are instructed to express vocally, what they are thinking while operating the equipment (think aloud method), as a devised means to gain as much understanding of the human cognitive process. The data are analyzed, around issues, such as “Do they understand the displays on the screen?”, “Are they able to do what they want to?”, “What are the mistakes and misunderstandings that often occur?” and “Is there any characteristic behavior?”, to clarify the issues of the equipment through the characteristic behavior of users.

An example of a usability test, as described above, was used to study the issues with ATMs for the elderly.



Phot. 1 A scene of a usability test

Case example: ATM usability test

Since the important issue in researching easy to use for the elderly is the “change by aging”, a comparison experiment by younger age groups, was conducted. In order to conduct a separate study of the cognitive characteristics for both perceptive and physical characteristics, a group of university students and also a group of university students wearing “instant elderly experimental equipment” (perceptive and physical motor characteristics of the elderly with the cognitive characteristics of university students), were applied for the comparison.

(1) Methods

• Test monitors:

Ten elderly persons (five males and five females, aged between 61 and 77) dispatched from a silver temporary staff center. A group of six university students (two males and four females) as well as seven university students wearing instant elderly experimental equipment (four males and three females) were involved for comparison.

It was known from a preliminary survey that as far as the use of ATMs was concerned, all three groups were of the same level (the average frequency of monthly fund withdrawals and the transferring of funds is once or twice).

• Experiment equipment:

As an intended system, an ATM simulator was set up (a personal computer and a touch display are installed in a paper model housing) and ordinary transaction operations were then to be performed. A video camera, tiepin-type small microphone, recording equipment, etc., were prepared as the recording media.

• Experiment procedure:

Each test was conducted by the individuals. First, an explanation of the objectives of the usability test, an explanation for the use of the equipment, practice of the thought utterance method and preliminary questionnaire survey concerning the use of ATM, were conducted prior to performing the tasks. A follow-up questionnaire survey

was conducted once the tasks had been completed and additional interviews were also conducted. The tasks were (1) withdrawing cash using a cash card, (2) making a balance inquiry using a cash card, (3) making a term deposit payment using a passbook and (4) making fund transfers (two tasks) that made a total of five tasks.

(2) Results and discussion

The duration of each test by the test monitors was approximately 30 minutes for the group of students, just under one hour for the group of students wearing instant elderly experimental equipment (including the time it took to put the equipment on and practice with it), while it was about an hour and a half for the group of elderly people.

Utterances and behavior during the experiment were all written down to primarily analyze errors and their causes.

Errors and problems were believed to have arisen from the poor design of the screen. According to the analysis results, since the university students also made errors and experienced delays in their decision-making, the symptoms of the problems could be interpreted as being common problems for all three groups.

Further, when the group of students wearing the instant elderly experimental equipment were compared with the group of elderly, the deterioration in their overall response speeds, the extension in time required to understand the displayed messages, cautious operating methods and means. All indicated that the group of students wearing the instant elderly experimental equipment resembled the group of elderly people. In the problem solving process, however, they were no different from the group of general university students, as results indicated they differed from the group of elderly, which clearly showed the influence of cognitive characteristics because of their age.

The following tendencies were observed as cognitive characteristics and behavioral characteristics that are traits of the elderly.

1) Longer response time

The time required for entries was quite long, when using the 50 character keys, which involved the time to insert a passbook or cash and the overall time to respond to individual items. This often resulted in a timeout, which meant many of the elderly needed to repeat the procedure operation from the beginning. A comparison of the average achievement times for each task revealed that the group of elderly required twice as much time as the group of university students for withdrawals and three times as much time for fund transfers.

By repeating the same operations, such as the entering of one's name using the 50 character keys, however, it was found that the elderly also learned, which resulted in a shortening of time for such tasks.

2) Difficulties in collecting information in a short period of time

Under certain conditions, they experienced difficulty in collecting the necessary information all at once, such as being able to read only a portion of the messages displayed on the screen.

3) Excess response to voice messages

In general the voice message prompts prevented the elderly from forgetting to press a key (example: A voice

message such as "Please verify the amount and press the 'Confirm' key if the amount is correct"), however, when a voice message prompting them to "enter your name" was given at a time after the name was entered, the elderly proceeded to enter the name again, even though the name entry had just been completed.

4) Recurrence of the same errors

It was found an operational error was once made, then there was a tendency to repeat the same error. It appears that it is difficult for the elderly to determine what status they are currently in or how the operation was done previously, and making it difficult for them to avoid the same errors.

5) Difficulties in understanding the current experiment status and tasks

It was difficult for the elderly to comprehend experimental tasks, which were given based on imaginary situations as "let us suppose that it is". Further, their behaviors were often observed, which involved them changing their mind while they were in the middle of performing the task, (example: Taking the liberty of quitting the task when depositing money for a term deposit, by saying "when I go and make my deposit for the term deposit account, I actually go to the teller anyway and ask many questions"). In this way, it is clear that there are problems with the understanding of the experiment itself, which imply that care is necessary for setting tasks when conducting experiments with the elderly.

6) Influences of social pressures

Further, during the follow-up interview quite a few people mentioned the social pressures they experienced, such as not wanting to be a nuisance to people around them or not wanting the people around them to be aware of their deteriorated capacity, which implies the possibility that the changes in their cognitive characteristics are impacted by social factors.

Observations concerning the characteristics of the elderly

Other than the ATM experiment mentioned above, new information has been acquired on the characteristics of the elderly³⁾ with respect to their operation of equipment, and obtained from usability tests on a variety of equipment.

For example:

- They readily respond to items that are easily seen or can be touched directly by hand (example: hardware keys).
- They do not readily notice the changes in information displayed on the screen.
- They cannot extract the necessary information (or they will try to read all the information, but will get tired in the half way through and can not finish the reading).
- They do not have any independence of will (or they will just follow the order for instance when they are asked to push keys).

By sorting out the problems of the elderly obtained through various experiments, it appears that the three factors as shown in Fig. 4 overlap each other in a complex manner, causing the phenomena that the elderly "cannot use equipment".

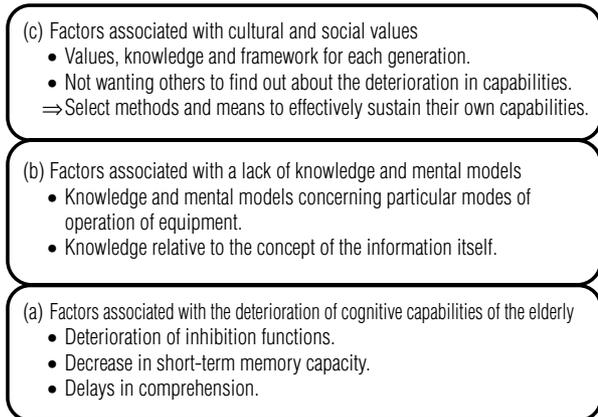


Fig. 4 Ease of use and cognitive aging: A three-layered factor model
(The material was touched up and corrected by Harada and Akatsu³⁾)

The three factors are:

(a) Factors associated with the deterioration of the cognitive capacity of the elderly

Factors that are the basis for the inability to use equipment are the deterioration of the cognitive function, which occurs by aging. As reported by researches in the field of experimental cognitive psychology, the deterioration of capabilities due to aging is considered to have a clear influence on the matter.

(b) Factors relevant to the lack of knowledge and mental models (for equipment and systems)

A mental model is an image that a user has of how equipment should be used. It is believed that the lack of such knowledge is accelerating the effects of cognitive aging outlined in (a), delaying the understanding on the operations of equipment.

Such problems arise from the rapid acceleration in the advancement of IT equipment. This brings difficulties for the elderly in the future. So long as new technologies are being developed at all times, however, it is believed that new problems, which are different from those today, will appear continuously.

(c) Factors relevant to cultural and social values

The elderly seem to have an attitude of not even wanting to try to use the equipment from the start by selecting methods and means that are beyond their familiarity (example: Using a teller rather than an ATM), as they do not want to be seen as being incapable. This factor is a problem for manufacturers. Still, as mentioned before, with the branches of many banks being consolidated and reduced in number, it is believed that there will be an increasing number of situations in the future when the elderly are forced to use ATMs, which are eventually difficult for them to use. As our agenda for the future, it is essential to broaden the scope of usability research and to conduct studies from other perspectives, such as what needs to be done to enable the elderly to use the equipment.

Conclusion

An experiment with usability tests was introduced as research for “usability for the elderly”. The results of the usability tests are being reviewed to formulate specific steps to accommodate the elderly, in order to provide products that are easy to use for the elderly people.

In the future we intend to delve further into the research, based on the three-layered factor model in Fig. 4 to deal with the fundamental problems of the elderly for “not being able to use” the equipment, as a part of our efforts to improve the usability of all sorts of equipment.

Special note:

This paper was drafted, based on research consigned to Professor Etsuko T Harada of the Hosei University.

References

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