Effectiveness of Communication Process Support for Senior Citizens with Information Machines

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Abstract. Senior citizens using IT services have two types of barriers; difficulty of machine use and lack of motivation to use service. External support is necessary to lower these two barriers by enhancing interface usability and promotion of use. In this paper, experiments that were performed to prove the effectiveness of such supports were discussed. The results of the experiment showed that promotion of communication among users was effective to lower both of the two barriers.

Keywords: senior citizen, communication, information machines, IPv6.

1 Introduction

Some machines for IT such as PCs are not yet in common use by senior citizens aged 65 and older. In Japan, the rate of PC usage is 22.7% among those in their late 60s and 7.9% for those in their 70s. It is indicating that a large generation gap remains[1]. As the cause, the existence of the necessity of using, and the difficulty of an operation of the equipment itself can be considered. In a similar previous study, these were the top two reasons given for not using the Internet[2]. Past research reports also suggested that there were psychological barriers to the use of information machines by senior citizens and that, in addition to technical support, senior citizens require content that would increase their eagerness to use the information machines[3],[4].

Considering this state of affairs, we can easily imagine that even though there are services useful to senior citizens, there are many situations in which senior citizens cannot take advantage of them simply because they have to go through information machines. In the future, providers of services need to consider not only how to provide better services but also how to make services accessible to more users.

For this report, Toshiba worked with the city of Yamanashi and the University of Yamanashi to use next-generation Internet technology (IPv6: Internet Protocol version 6) in an experiment running from December 2003 to February 2004[5]. Based

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on the experimental data, the research clarified the usage status of information machines among senior citizens and the barriers to such usage. The research also confirmed the effectiveness of usage promoting mechanisms put in place to remove those barriers.

2 Senior Citizens' Inclination to Use IT Services

We interviewed senior citizens to find out about their lifestyles and how they were using information machines. Based on the results, we discuss senior citizens' perceptions of information machines and the possibilities for incorporating information machines into their communication activities.

2.1 IT Services in the View of Senior Citizens

Interviews were held with three healthy senior citizens, male and female, in their 80s and residents of the city of Yamanashi. Constructive interviews were held at the subjects' homes. The interviews focused on three general topics: 1) the subject's current situation (public services used, communication, degree of contact with information); 2) needs (challenges with their current situation, what they would like to do); and 3) hypothetical surveying (possibility of accepting information services, likelihood of using information machines).

The result indicates that the senior citizens were more eager than expected to actively acquire information. It also revealed, however, that although the subjects wanted to use information machines, they were not doing so or could not do so presently because it seemed difficult and they did not know how. The most important fact revealed was that the subjects were satisfied with their current machines and their activities and experience. So although they were interested in new machine, they did not feel much need for using them.

2.2 Barriers to IT Use by Senior Citizens

For senior citizens, using IT services is a new experience in which they use machines they have never used before. There are two problems before senior citizens use IT services: lack of motivation to use service and difficulty of machine use.

The barrier concerning lack of motivation to use service is that although they understand logically that using these services would add to their convenience, they are actually hesitant to try, because senior citizens are satisfied with the status quo. They already use without problems, such as ATMs and cell phones, etc. Once the user tries using these things, they continue to use them, and do so without hesitation like these apparatus. For this reason, a sense of unease toward new experiences as well as the sense that they would be too much trouble appears to be the main barriers. If a person tries something once and can be persuaded that this new experience is convenient for him or her, it opens the possibility of continuing use.

The barrier concerning difficulty of machine use is expressed in two ways. In the first case, the user does not know how to use a machine and does not touch it for fear it will break. In the second case, the user uses the machine, but finds that operation is

complicated, so they prematurely give up using it. The fear of breaking a machine and the irritation by difficulty in using process, are thought to be the reasons the user give up. For these reasons, one issue is how to design machines so they are easier to use.

The two barriers are really opposite sides of the same coin. During initial use of a machine, the user has to work hard learning how to use it. On the other hand, as the senior citizen learns to operate the machine and becomes able to accomplish his or her intended function, the experience derived becomes accepted as something beneficial. This beneficial experience leads in turn to further use of the machine. If the process of learning to operate the machine does not go well, however, and it is too difficult to achieve the intended function, then the person will feel that the experience of using the machine or service was uncomfortable. In that event, continued use becomes mentally taxing and the person does not gain experience.

It is predicted that systems and machine designs allowing senior citizens to appreciate the benefits of experience and learning would mitigate the barriers and expand the usage possibilities.

3 Overview of Experiment

In this section we verify whether mechanisms and machine designs implemented lowering of the barriers actually encourage senior citizens to use IT services.

3.1 Experimental Machines and Participants

The network used in the experiment was that of Yamanashi CATV Ltd. It linked the subjects' homes with the Yamanashi City Hall and the testing office. Figure 1 shows an example of the terminal in use.

Fig. 1. The IT home terminal. The terminals used by the subjects were equipped with teleconferencing camera and microphone and were controlled by a touch-sensitive panel.

The subjects were recruited from 30 households housing a person of 59-82 years of age living in the city of Yamanashi. Of these, about two-thirds of the participants claimed they had no experience with information machines.

3.2 Systems and Services Provided for Verification of Experiment

Six services whose senior citizen probably gets interested were provided. The notification service, teleconferencing function, calendar and bulletin board could only be used among the subjects. However the subjects could use the e-mail and Internet services also with non-subjects.

The machine could be operated by a touch panel, which was usable even by those unaccustomed to keyboards. The user interface featured large characters and buttons, and screens were developed based on the results of the pre-survey and designed to be operated as easily as possible by senior citizens.

3.3 Mechanisms for Promoting Usage

We intervened to control the experiment rather than giving assignments full discretion. This intervention consisted of various conditions and mechanisms with the focus on technical support and presentation of assignments during the period of the experiment. Figure 2 gives the experiment schedule and a list of steps taken.

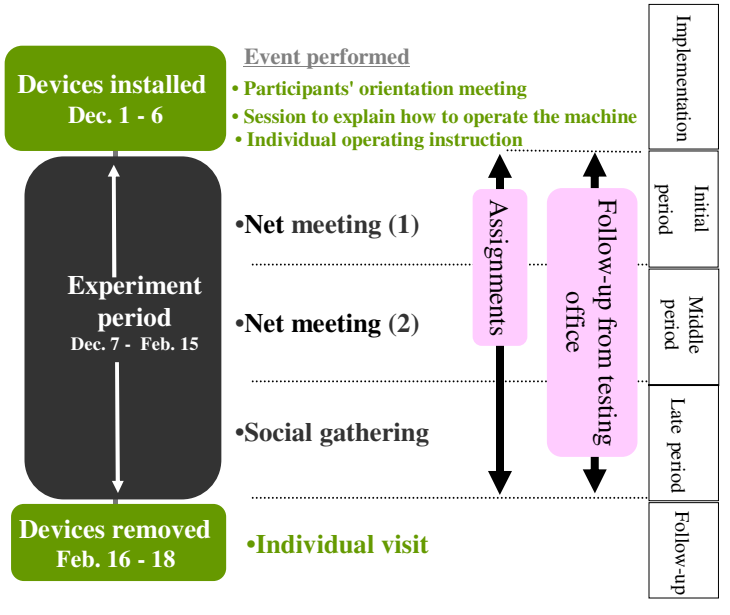

Fig. 2. Experimental mechanisms. Various technical support and assignments were given during the experiment to the experimenter.

The follow-up from the testing office consisted of appeals, by e-mail and notification, based on promoting the use of machines and services intended to promote communication with participants outside the group that applied. An advice center was also set up to deal with any problems encountered while using the machines, so there was constant operating support.

Assignments were given that used teleconferencing, e-mail and the bulletin board in order to encourage communication within and beyond the group applying to be in the experiment.

Miscellaneous events were held to create motivation to participate in the experiment and lower the barriers to operating the machines. Meetings were held to orient the subjects and explain the machines at the time of implementation, and subjects also received individual explanation in the home. At events held during the experiment period, subjects had a net meeting with the city mayor by teleconference, and subjects teleconferenced to discuss their opinions. A teleconferencing week was also set up, during which subjects held teleconferences at set times.

Assignments were given to be performed, however, no penalties or other psychological pressure was used. We asked subjects to complete these assignments, and the subject can use the system voluntarily.

3.4 Actual Use (Experiment Results)

Figures 3 show the results for the two months of the experiment.

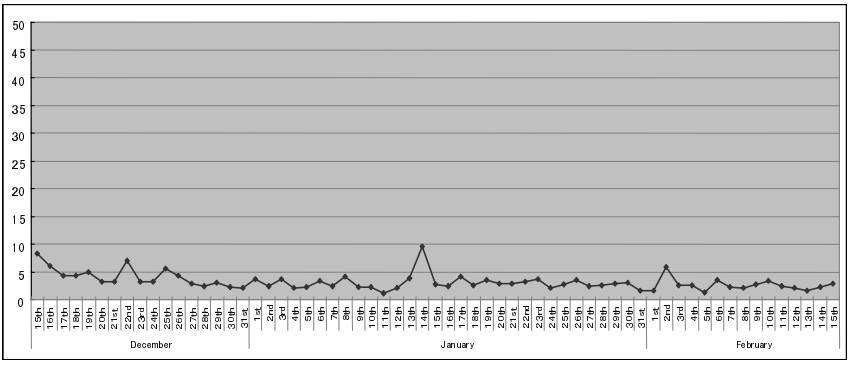

Fig. 3. Machine usage frequency. The vertical axis of the graph shows the number of times the machine was turned on, while the horizontal axis represents the time of the experiment (from December 15, 2003 to February 15, 2004).

Figure 3 shows the average number of times the machine was turned on for all subjects. The average daily frequency for all participants was three to four times a day throughout the experiment period. The data shows that there was not any one day in which none of the subjects turned on the experimental machine. The high number of uses at the beginning of the experiment (in mid-December) was influenced by the orientation sessions held at the users' homes when the experimental machines were being installed. Users on average did not subsequently greatly reduce their frequency of use. That suggests the experimental machines found steady use.

The month-by-month usage frequencies for the services show a declining trend from the start to the second half of the experiment, but nearly all the services were used once a day. The bulletin board and teleconferencing function were particularly

well used. The results of the post-experiment questionnaire show that at least 50% of the user used all the provided services, with the percentages of user using the bulletin board and teleconferencing function being particularly high. The subject recognized it as having used well.

The above results show that the senior citizens were able to use machines and services previously unfamiliar to them.

4 Acceptance of IT Services by Senior Citizens

Below is a discussion on the effectiveness of external support for encouraging acceptance of IT services.

4.1 Effectiveness of Technical Support

To avoid a situation where subjects initially refused to use the services because they did not know how to operate them, we provided three types of training as technical support: a session to explain the experiment; a session to explain how to operate the machine; and individual operating instruction.

An advice center was also available during the period of the experiment. The center provided support by telephone, and in those cases where the telephone was insufficient to deal with the situation, the testing office provided operating support when its personnel met with the subject, such as when sending someone out to teach the subject or when taking surveys.

Most of the subjects in this experiment were beginners at using information and communication machines. For that reason, it was predicted that in the initial stages the subjects would feel unsure whether they would be able to operate the machines, that they might not adequately understand the machines, and that these would be psychological barriers to accepting them. From the experiment result, it appears that the devices were well used overall. On a questionnaire given at the session for explaining the machine (before the experiment), more than 90% of the respondents said they thought using the machines would be fun, however about 80% said they felt confused about the machines. The advice center, moreover, was used nearly every day throughout the experiment period. During the first half of the experiment, there were at least 10 inquiries per day, which declined to just a few per day in the second half. In the final 10 days before the experiment ended, it would not have been a problem to shut down the advice center.

This indicates that the various training sessions held before the experiment, although they may have implanted an inclination to use the machines, did not adequately eliminate the subjects' sense of unease about operating machines. Also, nearly all the subjects felt unsure while operating the machines and inquired at the advice center. In interviews taken after the experiment, many of the subjects said that getting advice by telephone, coming in addition to individual machine explanation, was very effective.

These forms of support therefore apparently helped the subjects feel at ease using the machines.

4.2 Information and Communication Machine Acceptance and Usability

Results of the post-experiment questionnaire on user friendliness of the interface are given in Figs. 4. Positive responses on the question of ease of use were lower even than those concerning the impression of the experimental machine. The reason is that there are significant problems of usability, such as character input.

The assessment of user friendliness of individual functions was low for character input. This is related to the operation of some major functions, the e-mail and bulletin board, so these appear to be important interfaces for users. A low assessment was also given to the microphone and speakers, items related to senior citizens' physical abilities.

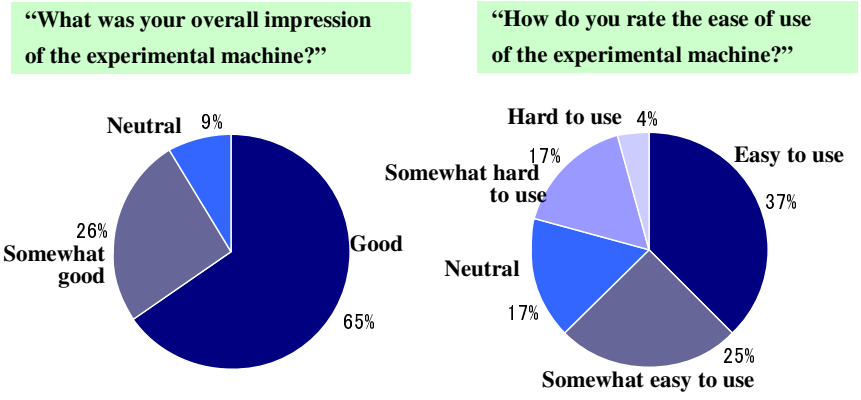

Fig. 4. Impression of machine and user-friendliness. The left graph a left graph is the answer to the question of "What was your overall impression", the right graph is an answer to the question of "How do you rate the ease of use".

Additionally, although a hiragana-only keyboard was provided from the start, users asked for a character conversion function as they used the machines more, so a standard soft keyboard such as is commonly used was provided. Furthermore, the inquiries to the advice center shifted from the very basic (such as how to turn the power on and off) to the complex (how to do things that were not necessary in standard use). This suggests that as the subjects used the machines more, the scope of that use increased and they started to use advanced functions. The post-experiment interviews yielded many comments supporting these views.

The above suggests that the level of the subjects' operating proficiency rose over time, as illustrated in Fig. 5.

Many of the subjects in this experiment were beginners at using information and communication machines. In the initial stage of introducing the machine, the subjects felt unsure of whether they would be able to operate the machines as well as not adequately understanding the machines. These beliefs became psychological barriers to accepting the machines. Performing assignments, moreover, helped them grow accustomed to operating the machine to some extent, and to overcome the barriers to learning how to operate it. Subsequently, as time passed, the user became more

proficient, and when they had improved a certain amount, they had reached the limit of skill improvement.

It was also shown that important factors for lowering the learning barriers were an easy-to-use interface and services that were themselves easy to use, as well as reducing machine problems. In any case, a necessary condition for senior citizens to accept a machine is the ability to use the machine and accomplish the intended task, even if the user has just begun using the machine. Machines must be designed to meet this condition.

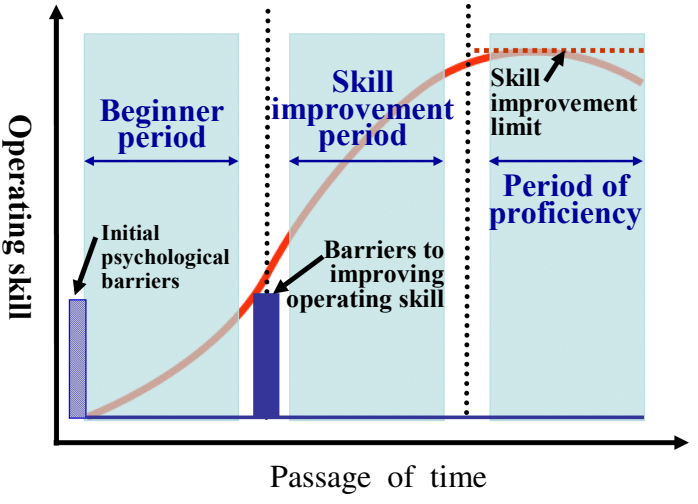

Fig. 5. Proficiency over time. This figure is expressing the mastery process in apparatus exploitation typically.

4.3 Effectiveness of Supports for Promoting Usage

During the experimental period, using of the system was performed by a subject's free will. In order to promote communication, however, subjects were given such assignments as sending New Year's greetings to each other by e-mail and posting notes to the bulletin board. Opportunities to use the machine were also given, such as a net meeting with the city mayor using the teleconferencing function. To help the subjects browse information frequently, the testing office frequently updated the information displayed on the screen and sent messages and greetings by e-mail every day.

Only about one-third of the subjects actively carried out the assignments of sending e-mail or posting messages on the bulletin board, whereas more than 80% of the user read about them. This indicates that giving assignments itself was effective for some subjects, but did not lead directly to usage of the machine. The fact that subjects were browsing the information, however, suggests that their perception of participating in the experiment and the sending of e-mail from the testing office made the subjects feel obligated to check the content of the messages, which promoted usage.

Figures 6 show the frequency of usage of each service for two subjects with very different levels of usage frequency.

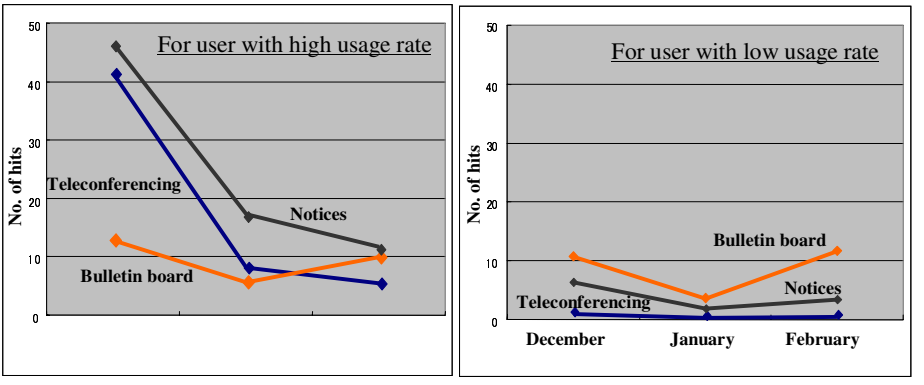

Fig. 6. Service usage frequency .The left graph expresses the number of times of exploitation of the moon average for every service of a user with high exploitation frequency, the right graph expresses for every service of a user with low exploitation frequency.

The trends in the frequency of using the teleconferencing and notification functions show that the subject with a low usage rate started out with low usage and this did not change greatly, but the subject with high usage rate greatly reduced the number of uses in the second half as compared to the early period. This subject had been looking forward to using the teleconferencing function since before the start of the experiment, and in the early stages had tried using it frequently. However, after this person tried dialing a teleconference several times and the other party did not answer, the subject gave up after a few weeks. This situation is also seen in e-mail and other services. In post-experiment interviews, subjects said that they quit using a service because they were not getting replies.

In contrast, the bulletin board suddenly got increased use in February, for both the subject with high usage and the one with low usage. The subject with low usage in particular used this service more often than in the early stages. This is because a social gathering was held to build friendships among users in the latter half of January. Up to that point, the users' only exchanges had been over the network. So meeting actually was very effective in promoting usage. The subjects made active use of the machine at the social gathering without any encouragement by the testing office. There was active use of the bulletin board. By using this service, subjects did not require a specific partner for interaction but could have communication with unspecified others. Looking at the number of messages posted by each subject, there were very active users and less active users, however even less active users used the service, participating as readers only. There were many users who enjoyed reading messages on the bulletin board.

The above indicates that a sense of obligation and achievement of an objective are important factors for promoting usage, and it has also been shown that community-building is also significantly related.

5 Support for Promoting Use by Senior Citizens, and Issues

The experiment found two types of psychological barrier to the use of information machines by senior citizens: difficulty of machine use and lack of motivation to use service. The experiment further showed that the characteristics of each of these vary from the initial usage stage (acceptance) and the stage of the usage process.

The difficulty of machine use is uneasiness and lack of understanding about the machines. As the person continues to use the machines, it is necessary to expand the functionality to meet the user's requirements. And it is basic to this need that the purpose is attained, when using. Meeting this need requires sufficient follow-up to eliminate the sense of unease, and it is also necessary that the machines can respond flexibly in keeping up with the user's level of proficiency.

The lack of motivation to use service includes a sense of unease toward new experiences and a sense that they are too much trouble. For overcoming this, it is required applying inducement to try the experience and helping the subjects understand the merits of the experience. Communication is effective for helping user to understand the merits, and having systems in place to encourage community-building lowers the barriers relating to inclination to use services.

Technical problems are closely related to problems with users' motivation to use the machine, so both of these have to be solved simultaneously to encourage usage. Many issues, such as the varying effectiveness of different approaches to support, remain. We believe that illuminating these issues will allow more people to take advantage of the benefits of IT services.

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