

# Development and Field Trial of a Social TV System for Elderly People

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**Abstract.** As the core of an innovative business model, we seek to develop an ICT (information and communications technology) platform called “Senior Cloud” that will activate communication among the elderly and utilize their knowledge and labor skills in the hyper-aged society of Japan, in which the percentage of people aged 65+ currently exceeds 21% of the total population. As one aspect of this effort, we studied what leads to the activation of communication among the elderly; specifically, we extended the viewing action and social graphs of the social TV system “teleda,” which features VOD (Video on Demand) and SNS (Social Networking Service) functions. In this paper, we describe several experiments that verify the possibility of employing social TV systems to activate the elderly.

**Keywords:** Social TV, Social Networking Service, Video on Demand, Senior Cloud.

## 1 Introduction

Japanese culture and society has always considered the elderly as “people who should be supported.” However, in recent years, the rate of aging in Japan has increased rapidly. As of October 1, 2011, ~29.75 million people were aged 65+, which is 23.3% of the total population [1]. Furthermore, as of 2010, 2.6 people of the current generation (aged 20–64) were supporting 1 elderly person, which by 2060 is predicted to be further skewed to 1.2 people of the current generation supporting 1 elderly person. This rapidly changing situation has led to ongoing pessimistic discussions about how a small number of young people are supporting a large number of elderly people.

Having said that, in recent years, the average life expectancy has also been increasing, and an increasing number of the elderly can in fact be considered “healthy elderly.” In keeping with this trend, increased social participation of such elderly is being witnessed. In this light, some ongoing discussions are optimistic in that we should consider some elderly not as “people who should be supported” but as “working power for improving the GDP.”

We have launched a joint research project called “Senior Cloud” in collaboration with the University of Tokyo and IBM Japan through which we aim to propose the

structure of a new society that supports elderly people possessing vast experience and knowledge by using ICT technology [2]. Our research project, which aims at giving back the knowledge and vitality of the elderly to society, consists of three phases. In the first phase, we will conduct research with the goal of activating the communication and lives of the elderly. In the second phase, based on various types of information provided by the activated elderly, we will develop a skill discovery technology and a job matching technology for the elderly to connect their skills to suitable employment. In the third phase, we will build a business model that will combine elderly people's knowledge and experience with a young work force to create value and various types of jobs.

This paper introduces the first phase of our research project, in which efforts are being made to activate the communication of the elderly. To build an environment in which the elderly can participate without reluctance and communicate actively, we have proposed an approach that uses the framework of SNSs (social networking services), which have enjoyed widespread popularity worldwide. We aim to use SNSs to enable the elderly to enjoy communication at their own pace without being bound to limitations such as time and location. We expect that we can extract elderly people's knowledge from communication logs recorded in the SNS and then use this knowledge for the development of the skill discovery technology in the second phase.

The rest of this paper is organized as follows. Chapter 2 presents an overview of existing related works on elderly people using SNSs. We also introduce a social TV platform and program-based SNS being developed by NHK, and we describe the potential of program-based SNS as a communication tool for the elderly. Chapter 3 reports on the experimental use and evaluation of program-based SNS by the elderly as part of a preliminary study of building systems for the elderly. Chapter 4 introduces the Social TV system for the elderly, which was developed in response to the preliminary investigation, and it describe practical demonstration experiments of its use by the elderly community. Chapter 5 provides an overview of the experiment results. Chapter 6 summarizes the discussion of the results and outlines future issues.

## 2 Related Work

In this chapter, we describe existing related works that have focused on the relationship between SNS communication and the elderly. In Japan, young people constitute the majority of SNS users, and they also constitute the majority of users of multiple SNSs [3]. In other words, most SNS users are people ranging from teenagers to those in their thirties. Considering the age bracket of PC users, it's believed that there are some kinds of barrier for the elderly to use the existing SNS.

With regard to the relationship between SNS and the elderly, Pfeil et al. mentioned differences in social capital formation on SNS between the elderly and young people [4]. The network of the elderly in SNSs is obviously small and spread across a wide age group as compared to the case of young people. In addition, the elderly tended to be more selective when connecting with others and preferred quality-oriented connections. Furthermore, their posts and messages were also more formal. When building an SNS in which the elderly can communicate confidently, it is then necessary to take into account such characteristics.

At NHK, we have previously developed a social TV platform called “teleda,” and we have developed the new service for a combination of program content and user information such as viewing history, preferences, and social graph. Accordingly, we have developed an experimental Web site based on the teleda platform and investigated the relationship between user communication and program viewing through a large-scale field trial [5][6].

Fig.1 shows a screenshot of the experimental Web site. This site features a VOD (Video on Demand) function that can provide more than 2000 programs, and it also features an SNS function for communication. Therefore, users can freely watch these programs and interact with other users on the program’s topics and other themes. In a field trial conducted in 2010, it was revealed that the elderly were more active than young people. Therefore, we suggested that “communication over TV programs” is popular with the elderly.



Fig. 1. Screenshot of experimental Web site based on teleda platform

In this experiment, we evaluated the effects of communication (word of mouth) regarding the program viewing behavior, and we found that user communication could lead to an increase in the number of program viewings and the range of genres viewed. For elderly people who are reluctant to join conventional SNSs, program-based SNSs

can be used as a trigger to induce communication with others. Accordingly, we can expect a synergistic effect in that activating communication will expand the range of behaviors of the elderly, including activating further communication.

### 3 Preliminary Study on Use of Program-Based SNS by Elderly

To clarify how the elderly feel about communication using program-based SNSs, we conducted a comparative experiment of forms of communication with a group of 16 elderly people (age: 65+ years) who were unacquainted with each other. First, we divided these subjects into four groups of four each. Each group then sequentially experienced three forms of communication: face-to-face communication, video telephony communication, and program-based SNS. They watched TV programs and interacted with each other about the program topics using each form of communication.

In face-to-face communication, the four subjects sat around the same table together and carried out a free conversation while watching the TV programs on one large monitor. In video telephony communication, the four subjects each sat in different rooms and carried out a free conversation while watching the TV programs using a video chat system. Fig. 2 shows the experimental conditions for face-to-face and video telephony communication. During both of these experiments, one facilitator participated in each group; the facilitator was responsible for responding to the utterance of a subject and to provide a new topic when the conversation stopped.



**Fig. 2.** Comparative experiments of communication forms (Left: Face-to-face communication, Right: video telephony communication)

For the experience of program-based SNS, the subjects freely used the above-described Web site for approximately one week from home. Then, we conducted a questionnaire survey about the three forms of communication. The subjects evaluated each form of communication on a 3-point scale (1 being the lowest, 3 being the highest) for five parameters—sense of security, comfort, ease of talking, fun, and understanding—and they described the advantages and disadvantages of each form of communication through comments. 14 valid responses were obtained through this survey. Table 1 shows the evaluation results calculated using the points given by the subjects.

**Table 1.** Evaluation of communication forms through questionnaire survey

Communication form	Sense of security	Comfort	Ease of talking	Fun	Understanding
Face-to-face Communication	35	35	33	29	28
Video telephony Communication	21	21	24	25	24
Program-based SNS	28	28	26	30	32

Face-to-face communication scored the highest for sense of security, comfort, and ease of talking, and program-based SNS scored the highest for fun and understanding. 60% of the subjects rated face-to-face communication most highly because they could obtain a quick response from the conversational partners or could easily understand what kind of people they were talking to. The other subjects rated program-based SNS most highly because they could obtain a real sense of the program content, which should be the topic of conversation, or could feel a sense of security in using text-based communication in a conversation with a person they were meeting for the first time. Program-based SNS scored highly on fun because the subjects could properly understand the TV program at their own pace or because they could talk with others regardless of the time and place. It also scored highly for understanding because the subjects could both watch the programs and read the text-based conversation repeatedly and better their understanding. Video telephony communication probably scored lowly on comfort because many elderly people are not used to real-time chat.

These results suggested that in order to realize a program-based SNS that will prove popular with the elderly, it is important to build an environment that not only provides the advantage of SNS in that communication with others is not bound by time or place but also provides a place in which the elderly can easily communicate with each other. Further, to continue a group conversation, the presence of a facilitator is also important, and the questionnaire confirmed that the moderation of the facilitator made the experience more fun.

Based on these observations, we now introduce the development of a social TV system that should be popular with the elderly, and we discuss the field trial conducted using this system.

## 4 Development and Field Trial of Social TV System for Elderly

### 4.1 “Simple Teleda” Social TV System

This chapter discusses the development of the social TV system for the elderly and its field trial. Even if an SNS provides numerous features, it is expected that the elderly will only use a small set of these [4]. We built the “Simple teleda” social TV system based on the teleda platform. This system provides various functions of a program-based SNS, such as program viewing function and communication function, through a

simple interface. Furthermore, to provide a sense of security and to reduce the reluctance to communicate with others that one does not know well, which was one of the factors impeding communication among elderly in the SNS as revealed by the preliminary experiments, we implemented the ability to display the other person's profile information on a profile page and place of residence on a map. Fig. 3 shows a screenshot of the Simple teleda system.



Fig. 3. Screenshot of Simple teleda system

To verify the availability of this system, we conducted a field trial with local elderly communities in Kashiwa City, Chiba Prefecture, Japan. Below, we report on the experiments, which were carried out for 50 days from December 17, 2012, to February 4, 2013. This experiment was conducted in collaboration with the University of Tokyo and IBM Japan.

## 4.2 Field Trial in Elderly Community

This experiment was conducted with three main objectives: to validate how to build a community and how to moderate the communication in order to activate the communication of the elderly people participating in the community; to clarify the effects of program viewing that activate the communication of the elderly; and to evaluate the Simple teleda prototype system.

For this experiment, 58 elderly people (age: 65+ years) were recruited from among seminar students of the Institute of Gerontology, University of Tokyo. First, we

classified the TV program according to themes such as IT, travel, gardening, and health. Next, we divided the subjects into seven groups of 7–11 members according to their interest. Before the start of the experiment, each group was instructed in how to operate the Simple teleda, following which the subjects were asked to engage in face-to-face interactions with each other through self-introductions. Then, the subjects were asked to use the Simple teleda from their home and to freely interact with their group members about their theme of interest. Members of each group could freely post topics and comments. However, we imposed one limitation in that the subjects could not view the state of communication in the other groups. Furthermore, the subjects could not switch groups during the experiment. In other words, the subjects could only interact with their own group members, whom they had previously interacted with.

On the other hand, we created one special group comprising all 58 subjects; the theme of this group was “getting healthy,” a common interest of the elderly. We also created one announcement group. Only in these two groups, to whom we made a common announcement about the experimental information, could subjects interact with all members. 1–2 facilitators participated in each group, and they were responsible for responding to the posts of the subjects in the SNS.

Once the subjects were accustomed with communicating using Simple teleda (by January 7, 20 days after the start of the experiment), we provided 118 TV programs that were associated with the theme of the groups. All subjects could watch these programs freely in Simple teleda. A system log of user activities in Simple teleda (views and posts) over 50 days was stored and used for the analysis.

## 5 Experimental Results

In this chapter, we report on the results of the analysis of data obtained from the system log.

### 5.1 Usage of the Elderly

We describe the usage of the elderly over the 50-day experimental period, excluding the facilitator’s posts and system administrator’s announcements. First, the average number of unique users accessing Simple teleda daily was 20.8, the average number of unique users posting daily was 6.3, and the average total number of posts per day was 7.5. In addition, since January 7, the average number of users who watched programs daily was 4.5 and the average number of daily viewings was 12.9.

From the analysis of the groups, the total number of posts in the group with the maximum number of posts was 65, and the average number of posts per person was ~8.1. On the other hand, the total number of posts in the group with the minimum number of posts was 9, and the average number of posts per person was ~1.

We compared the frequency of access and posting before and after providing the TV programs. Although the average number of posts and unique users posting daily

remained almost unchanged, the average number of unique users accessing daily was slightly higher after the program were provided. The detailed effect of TV program will be described later.

## 5.2 Factors that Activate the Groups

Next, we describe the analysis of group activity. First, we compared the 7 closed groups, in which group members could only interact with other group members, and the open group, in which all 58 subjects could interact with each other. In the closed and the open groups, the average number of posts per person was 4.0 and 0.5, respectively. This suggested that the subjects could post with a greater feeling of safety in the closed groups than in the open group.

Furthermore, to clarify the factors that affect the activation of groups, we calculated the correlation between the various activities of the groups, such as the total number of posts and the total number of viewings.

Table 2 shows the correlation between the posting behavior of the elderly and the facilitator as well as the correlation between the posting and the viewing behavior of the elderly.

The relationship between the behavior of the elderly and the facilitators suggests a strong correlation between their respective posting behaviors. The elderly tended to provide many posts in groups where the facilitator provided many posts. The relationship between the posting and the viewing behavior of the elderly suggested that the elderly tended to provide a large number of comments in groups containing a large number of viewing users. In particular, there is a strong correlation between the viewing behavior of the elderly and the total number of comments ( $c = 0.79$ ) and total number of comment posting users ( $c = 0.78$ ). If we considered the number of posts in groups to be one of the indicators of the degree of activity of the group, it would appear that the number of posts provided by the facilitator and the number of viewings of the elderly affect the activation of the group. The facilitator served to create an atmosphere conducive for easy communication. In this situation, the facilitator did not provide new topics but simply responded to posts by the elderly. It is considered that the facilitator's responses activated posting and in particular, provision of new topics by the elderly.

On the other hand, there is a high correlation between the program viewing action and the number of elderly posting comments as well as the number of comments posted by the elderly. It should be noted that comment posting builds a connection with others, unlike topic posting. Topics related to the program may serve to activate user communications because the elderly can easily post comments about the topic of the TV program. Furthermore, the activation of communication caused by posting many comments may serve to facilitate the viewing of programs. The latter effect has already been revealed through a previous large-scale field trial using program-based SNS. If we can identify the causal relationship of the former effect, we could reveal the effect of program viewing upon the activation of user communication.



**Table 2.** Correlation data related to the behavior of the elderly in the groups. (excerpt)

		Behavior of facilitator		Viewing behavior of elderly	
		Total number of posts	Total number of comments	Total number of viewing users	Total number of viewings
Behavior of elderly	Total number of posts	0.75*	0.75	0.70	0.33
	Total number of topics	0.90**	0.89**	0.43	-0.03
	Total number of comments	0.46	0.47	0.79*	0.58
	Total number of posting users	0.42	0.40	0.58	0.71
	Total number of topic posting users	0.51	0.49	0.59	0.53
	Total number of comment posting users	0.20	0.19	0.59	0.78*
	Average number of postings per person	0.86*	0.85*	0.53	0.08

\*  $p < .05$  \*\*  $p < .01$ 

## 6 Discussion and Future Work

We considered that in an early phase, the elderly should interact with others whom they are acquainted with, before gradually expanding the scope of their communication. In addition, the experimental results suggested that the actions of facilitators may promote the number of posts provided by the elderly. Such observations provide certain guidelines for the first goal of the experiment, which is how to build a community and how to activate elderly communication.

However, the facilitator's activities only serve to activate a particular individual, and they do not lead to an increase in the number of users participating in the communication. In the future, we need to develop a facilitation technology that lets the elderly easily participate in the communication. We will continue to study a facilitation technique that can perform advanced interventions such as making counterproposals, generalizations, and refinements in response to the elderly posts.

We also showed the existence of a relationship between communication activation and program viewing. Therefore, we could indicate the possible effect of program viewing with regard to the second goal of the experiment. However, as mentioned, we

could not verify the causality. We will conduct a detailed analysis of the communication logs and clarify how program viewing contributes to communication activation.

In this experiment, we created groups based on different themes of interest; however, all groups were evaluated by the same process. Indeed, the fact that each group is characterized by its theme should be considered, because there will exist corresponding differences in the difficulty of communication. Furthermore, the analyses of different groups should be compared by taking into account the differences in theme.

As of March 1, 2013, we have continued second-phase experiments using Simple teleda. We are analyzing changes in the activities of the elderly when they are allowed to movement between groups, and we are verifying the effect of program recommendation and communication changes after offline meetings. In addition, after the experiment is completed, we will conduct an evaluation of the Simple teleda system through a final questionnaire, the results of which will be used in the development of the Social TV system for the elderly.

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