

Connecting Communities: Designing a Social Media Platform for Older Adults Living in a Senior Village

Tsai-Hsuan Tsai¹, Hsien-Tsung Chang², Alice May-Kuen Wong³, and Tsung-Fu Wu¹

¹ Department of Industrial Design, Chang Gung University, Taoyuan, Taiwan

² Department of Computer Science and Information Engineering, Chang Gung University, Taoyuan, Taiwan

³ Department of Physical Medicine & Rehabilitation, Chang-Gung Memorial Hospital, Taiwan
ttsai.cgu@gmail.com

Abstract. In order to develop an appropriate social computing application for senior users, the salient point of this research was to explore social and physical environments of a senior living community and social interaction between aging residents, and to investigate the key factors of technology acceptance for those older adults with little or no computer knowledge. The next step was to give an appropriate alternative communication technology applicable to the elderly and their living milieu, and thereby enhance their social interaction. The area of study was also concerned with determining social communication, perceived ease of use, enjoyment, and satisfaction for the new digital social platform via the technology acceptance model.

Keywords: elderly social model, user interface, smart social platform.

1 Introduction

The elderly are the fastest growing sector of society. The concomitant increase in burden from aging-related illness and impairments, such as chronic disease, physical disability and sensory impairment, psychomotor impairments, mental health, memory loss and learning disabilities, dementia, and others, makes it vitally important for older adults to remain independent and productive for as long as possible. While the majority of attention in aging research has focused on physical factors and functional requirements, a growing number of studies have presented evidence that suggests that psychological and sociological factors also have a significant influence on increased individual life expectancy and quality of life in older adults [1].

There are many studies of the role that the elderly play in society. Cumming and Henry [2] have proposed the Disengagement Theory which refers to reduced interaction between elderly and other people, a change in interpersonal relationships and a significant decrease in level of external participation at the same time as increased age and feebleness. According to the Activity Theory [3], people tend not to choose jobs with acute competition when they get old; they spend time on leisure and social activities instead. Related studies have pointed out that the interpersonal relationships and social interactions of the elderly report an extremely close impact on their

physiology. For example, leisure activities help enable a more positive physiology, and greater participation in social activities is beneficial to health and helps foster improved quality of life [4-5]. Bennett [6] indicated that social activities are considerably associated with the maintenance of physiological operations of the elderly, which help reduce the risk of Alzheimer's.

However, according to a related questionnaire survey on the daily activities of the elderly conducted by Gottesman & Bourestom [7], elderly people mainly follow regular daily activities. They report that for many elderly, 56% of the hours of the day are free time, 24% are spent on eating, washing, sleep, and other necessary behaviors, and only the other 20% are spent on social activities. As a consequence, this easily leads to mental factors such as boredom and loneliness. According to a discussion on daily life of the elderly by Harper Ice [8], the elderly mostly live alone in their daily lives, with 43% of their time spent on bedroom activities while only 4.2% of the time spent in the activity room, where they mainly engaged in passive leisure activities (55.5%), followed by necessary behavior (28%), social contact (12%) and convalescence (4.5%). Bondevik & Skogstad [9] found that the elderly reported low intention to participate in collective activities; they like to stay in public areas decorated with old furniture and plants and spontaneously chat with staff or few acquaintances around the table. Zimmer & Lin [10] also mentioned that the elderly in Taiwan reported less than a quarter of their time spent on participation in social activities and emphasized the importance of encouraging the elderly to participate socially.

1.1 Leveraging Technology to Encourage Social Interaction

The use of computers and online technologies has the potential to enhance social connections and communication in a variety of ways [11-17]. Such communication technologies provide new ways to help seniors remain socially connected with their peers and family members. However, these technologies are often designed for people who are familiar with using such technology, and so present barriers for the majority of older adults who are inexperienced computer users [16-17]. Unlike young or middle-aged people, many elderly people are not used to interacting with computerized devices and may encounter great difficulties in operating a system with a mouse or keyboard.

Since the announcement of Microsoft Surface [18], multi-touch interaction with computationally enhanced surfaces has received considerable attention. Instead of "direct" operation with a mouse or a keyboard, this is tangible manipulation with a finger. Tangible manipulation offers advantages over conventional workstations, especially for those older people who are unfamiliar with computer input operations. For this reason, multi-touch sensing technology may be an ideal solution for the elderly users in this study. However, mainstream multi-touch research has focused on showcasing its innovative functionalities, and often limits access opportunities for the elderly, virtually neglecting the needs and expectations of older people. Hence, a fundamental rethink of how communication technologies help to solve the challenges of an aging population, the match between what is available and the needs and expectations of older people, and more importantly, how users interact with digital technology, is required.

In order to develop an appropriate social computing application for senior users, the salient point of this research was to explore social and physical environments of a senior living community and social interaction between aging residents, and to investigate the key factors of technology acceptance for those older adults with little or no computer knowledge. The next step was to give an appropriate alternative communication technology applicable to the elderly and their living milieu, and thereby enhance their social interaction. The area of study was also concerned with determining social communication, perceived ease of use, enjoyment, and satisfaction for the new digital social platform via the technology acceptance model.

2 Sharetouch Design and Development

Our Sharetouch program (seen in Fig. 1 and Fig. 2) presents an alternative social community platform designed for older people and for senior communities. Starting from “table” which uses social activities with which Taiwanese seniors are familiar, it emphasizes having conversations and interacting with users in a closer-to-life attitude than was ever available before. Moreover, instead of the commonly-used mouse cursor and keyboard, it invites the user to touch the onscreen objects directly and allows elderly users to interact with it easily without a barrier. In order to cater to the demands of social activities in Multi-User and Multi-Touch, a 52-inch touch panel planned by Sharetouch can be easily operated by 4 people at the same time.



Fig. 1. Sharetouch prototype



Fig. 2. Real screenshot of communication interface

2.1 System and Hardware Functions

The Sharetouch system (shown as Fig. 3) is primarily composed of a large touch module, control mainframe, identity module and remote server. The platform constructed by the entire system enables multiple users at the same time and provides multi-touch function. It supports Bluetooth technology to share information from a cell phone or PDA, USB portable hard disks, and has multiple inputs for files and information from digital cameras and other sources through the control PC. In addition, in order to allow users to carry no extra IT products and share data, we introduce

Web HD and RFID technologies to allow users to access their own Web HD data as long as they carry an RFID card (integrated into the ID cards of residents). They can jointly enjoy personal music, videos, documents, share images with other people, and even conduct file exchanges with others using a fast and convenient sharing interface via Sharetouch. The Sharetouch hardware includes a voice control system, 4-in-one card reader, RFID Identification System, touch screen and the following devices:

- **Touchscreen.** the mouse, keyboard, stick and other products all belong to high-tech products. These are reported to introduce a certain level of difficulty in learning for many elderly people. Therefore, Sharetouch starts with the image of a pond on a touchscreen. The product will be demonstrated in casually, where the elderly are allowed to conduct social interaction in a natural way via the touchscreen function.
- **Voice control system.** a voice control system device is hidden in front of the seat of every user. Each user's voice can be clearly received no matter the background noises or special effects of interface or personal data.
- **4-in-one card reader.** considering the need of users to share pictures and other files, the system incorporates a 4-in-one card reader. This will support many types of cameras, V8 and other products.
- **RFID Identification System.** the elderly community experiences a certain level of in mingling with new persons. Therefore, through RFID identification, a personal database such as personal theme music, personal sayings etc. can be established to help elderly people to take their first steps of social contact to make the opposite party understand and also get to know every user who used Sharetouch through interactive interface, as the records of each person will stay in the system.

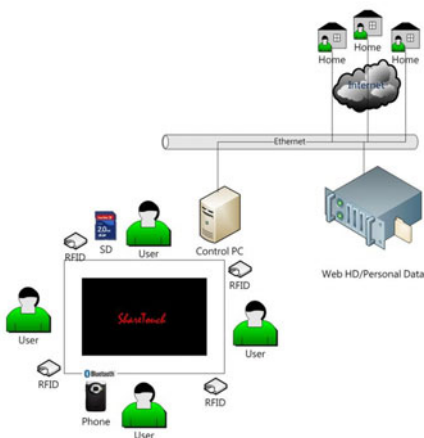


Fig. 3. Functions of Sharetouch system

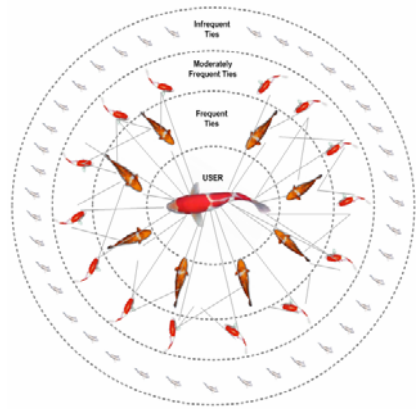


Fig. 4. Concept map of Sharetouch program

2.2 Interface Design and Social Interaction

Following a “pond” oriented concept, there are microphones established at four edges of the table. There will be a change in waves which varies upon sound direction when

a voice is detected. There will be a change in water flow if the user gently stirs the water surface; the direction of water flow changes along the direction the user stirs, and the objects on the surface of the water will move accordingly when there is a change in water flow. Among the symbols on the pond will be lotus flowers, lotus leaves, turtles, frogs, dragonflies, and bees, as well as fishes of different kinds and quantities (seen in Fig. 2).

The definition of Sharetouch program is a special type of a social network that is centered around one senior community and community residents, in other words, it is viewed as the system of relations between residents' personal networks. In terms of social networks, size and density are two important characteristics [19]. Social size refers to the number of nodes in a network; and social density is the relative amount of contact (ties) in a network, and also can be presented as the number of connections divided by the maximum possible number of connections for sociocentric networks [19]. In addition, the role and distribution of ties in social networks are considered. Haythornthwaite[20] indicated that there is a range of ties of different strengths in any individual's network ranging from weaker ties, more instrumental ties to more intimate, strong ties. Hence, the analysis of residents' social network, including the role and distribution of ties in personal networks, is taken into account in this study. Fig. 4 maps the egocentric network of a Sharetouch user and shows layers of different tie strength. The Sharetouch program simplifies a social network as layers of frequently, moderately frequent, and infrequently ties; and furthermore a relationship between the strength of ties and the frequency of interaction as well as the number of contacts.



Fig. 5. Real screenshot of a user's social network on Shaertouch platform.



Fig. 6. Generation of personal image while clicking on the bubble.

According to the concept map drawn in Fig. 4, each fish represents a user who once logged in this table; when the user logs in, his/her fish will swim from the bottom to the top of the water. Big fishes on the top represent the users present at the table while the small ones underneath are other users (as Fig. 5). The amount of fish represents a quantity indicator of social interaction which is equal to the community size; the dimensions of the fish are a qualitative reference of social interaction and also represent the frequency of social contact between users, i.e., the bigger fishes are friends with frequent interaction while the smallest fishes are less familiar friends or those with

less interaction. The interactive model of Sharetouch lies in direct touch on the fishes in the pond, where the fishes will spit out two bubbles. An image of that fish owner will be shown when the user clicks on one of the bubbles; clicking on the other one allows the user to listen to or leave a message to the fish owner (seen in Fig. 7 and Fig. 8) .



Fig. 7. Exhibition of bubble: You have a new voice message



Fig. 8. Exhibition of bubble: Send a voice message to the other participant

3 Technology Acceptance Model Measurement

The Technology Acceptance Model (TAM) has been widely employed to explain user acceptance and usage based on perceived ease of use and perceptions of usefulness [21-24]. The extended model, referred to as TAM2, was employed in this study. TAM2 encompasses social influence processes (subjective norm, voluntariness, and image) and cognitive instrumental processes (job relevance, output quality, result demonstrability, and perceived ease of use) as determinants of perceived usefulness and usage intentions [23]. Based on the TAM2 measurement scales and reliabilities, we proposed 6 hypotheses attempting to examine user acceptance of Sharetouch for older people. The hypotheses are listed as below:

H1: *Intention to Use has positive impact on intention of older people using Sharetouch.*

H2: *Perceived Usefulness has positive impact on intention of older people using Sharetouch.*

H3: *Perceived Ease of Use has positive impact on intention of older people using Sharetouch.*

H4: *Enjoyment has positive impact on intention of older people using Sharetouch.*

H5: *Output quality has positive impact on intention of older people using Sharetouch.*

H6: *Result Demonstrability has positive impact on intention of older people using Sharetouch.*

3.1 Method

The TAM measurement was conducted in a senior housing community, Chang Gung Health and Culture Village, Taoyuan Taiwan. 52 elderly residents aged 64 to 91 years, including 17 males and 35 females, participated in this study. After a short demonstration conducted by the researchers, a TAM questionnaire was distributed to assess the participants’ acceptance and satisfaction. There were 18 items in this TAM questionnaire. It is noted that all items were measured on a 7-point Likert scale, where 1=strongly disagree, 2=moderately disagree, 3=somewhat disagree, 4=neutral (neither disagree nor agree), 5=somewhat agree, 6=moderately agree, and 7=strongly agree.

Questionnaire analysis was based on SPSS for Windows 10.0. Participants’ basic information and score distribution of the items in the questionnaire were shown by descriptive statistics analysis with mean and standard deviation. The influences of gender and educational level on scores in the questionnaire were compared by independent t test, and influences of educational level and age on questionnaire scores were compared by one-way ANOVA. P value in the article is two-tailed and the significance level is 0.05.

3.2 Results

Average age of the participants is 78.33 ± 7.53 years old. According to the ages, the elderly are classified into young-old, (65-74 years old), old-old (75-84 years old), and oldest-old (above 85 years old), as shown in Table 1. Table 2 shows the educational level of the 52 participants.

Table 1. Frequency distribution of participants’ ages (n=52)

	Male	Female	Total
Young-old (65-74)	1	13	14
Old-old (75-84)	14	15	29
Oldest-old (≥ 85)	3	6	9

Table 2. Frequency distribution of participants’ educational level * (n=52)

	Male	Female	Total
Elementary school	1	4	5
Junior high school	1	6	7
Senior high school	3	9	12
Above university	12	14	26
* Two participants’ information is uncertain			

Table 3 and Table 4 show the percentage of 52 elderly participants’ scores on their questionnaire. The participants’ subjective evaluations on the interactive table were refer to levels “excellent” and “good.” In terms of influences of gender on scores of the 18 items, the subjective scores of gender refer to level “good.” There is no significant difference in scores resulting from gender. It is demonstrated that educational levels have a significant influence on scores among these participants. In this TAM analysis, influences of age on scores demonstrated no significant effect among 52 elderly participants.

Based on the findings of the TAM measurement, all proposed hypotheses, such as intention to use, perceived usefulness, perceived ease to use, enjoyment, and output quality had a positive and significant impact on the intention of older people to interact using Sharetouch.

Table 3. Subjects' distribution (%) in each item in Sharetouch (n=52)

	Item	Distribution in percentage (%)			
		strongly	moderately	somewhat	neutral
		<u>agree</u> 7	<u>agree</u> 6	<u>agree</u> 5	4
1	Using "Sharetouch" improves the quality of interacting with others.	46.2	30.8	15.4	3.8
2	Using "Sharetouch" enhances my ability to interact with others.	32.7	21.2	17.3	23.1
3	I find "Sharetouch" helps me interact with others.	30.8	25	15.4	19.2
4	Using "Sharetouch" enhances the interaction with others.	26.9	25	19.2	15.4
5	My interaction with "Sharetouch" is easy for me to understand.	21.2	32.7	23.1	15.4
6	I find it is easy to learn to use "Sharetouch."	23.5	35.3	21.6	11.8
7	Overall, I find "Sharetouch" easy to use.	21.2	25	23.1	15.4
8	I find it easy to get "Sharetouch" to do what I want it to do.	21.2	28.8	17.3	21.2
9	I find it WILL be interesting using "Sharetouch."	15.4	32.7	21.2	19.2
10	It is a pleasant time when using "Sharetouch."	15.7	25.5	23.5	15.7
11	I find it interesting after using "Sharetouch."	53.8	21.2	15.4	5.8
12	If I got a chance, I would use "Sharetouch."	51.9	23.1	17.3	3.8
13	If you gave me "Sharetouch," I would definitely use it.	26.9	28.8	15.4	19.2
14	Overall, I am satisfied with the quality of "Sharetouch."	38.5	32.7	19.2	9.6
15	I have no doubt about the quality of "Sharetouch."	38.5	36.5	19.2	3.8
16	I am glad to share the benefits of "Sharetouch" with others.	23.1	40.4	23.1	5.8
17	I will exchange the experience of using "Sharetouch" with others.	21.2	28.8	19.2	17.3
18	I find it hard to distinguish between advantages and disadvantages.	11.5	11.5	11.5	19.2

4 Conclusion

Sharetouch aims to enable elderly persons to engage the benefits of IT and enhance their social interaction, and also presents an alternative digital social communication technology for older people and senior communities. Unlike most of the digital devices on the market, the Sharetouch social community platform attempts to merge the digital desktop and physical table into one, and provides pre-elderly and elderly a simple, easy-to-learn, easy-to-use and friendly user interface. In addition, a simplified of social network map as a concept of Sharetouch social media platform is presented in this study. Finally, the TAM was employed to measure user acceptance and usage of the Shaertouch social platform and received positive feedback from those residents living in a senior community. Further research is needed to continue analysing the other factors that will also influence social interaction and the inclinations of the older adults' intention in using a particular interaction technology, such as Sharetouch.

Table 4. Subjects' distribution (%) in each item in Sharetouch (n=52)

	Item	Distribution in percentage (%)			Mean average
		somewhat disagree	moderately disagree	strongly disagree	
		3	2	1	
1	Using "Sharetouch" improves the quality of interacting with others.	3.8	0	0	6.12±1.06
2	Using "Sharetouch" enhances my ability to interact with others.	0	5.8	0	5.46±1.45
3	I find "Sharetouch" helps me interact with others.	3.8	1.9	3.8	5.38±1.59
4	Using "Sharetouch" enhances the interaction with others.	3.8	3.8	5.8	5.21±1.71
5	My interaction with "Sharetouch" is easy for me to understand.	0	7.7	0	5.37±1.39
6	I find it is easy to learn to use "Sharetouch."	3.9	3.9	0	5.51±1.30
7	Overall, I find "Sharetouch" easy to use.	11.5	3.8	0	5.17±1.44
8	I find it easy to get "Sharetouch" to do what I want it to do.	7.7	3.8	0	5.23±1.41
9	I find it WILL be interesting using "Sharetouch."	9.6	1.9	0	5.19±1.30
10	It is a pleasant time when using "Sharetouch."	9.8	5.9	3.9	4.88±1.62
11	I find it interesting after using "Sharetouch."	3.8	0	0	6.15±1.13
12	If I got a chance, I would use "Sharetouch."	3.8	0	0	6.15±1.09
13	If you gave me "Sharetouch," I would definitely use it.	1.9	5.8	1.9	5.35±1.55
14	Overall, I am satisfied with the quality of "Sharetouch."	0	0	0	6.00±.99
15	I have no doubt about the quality of "Sharetouch."	1.9	0	0	6.06±.96
16	I am glad to share the benefits of "Sharetouch" with others.	3.8	3.8	0	5.62±1.24
17	I will exchange the experience of using "Sharetouch" with others.	5.8	7.7	0	5.19±1.50
18	I find it hard to distinguish between advantages and disadvantages.	13.5	19.2	13.5	3.77±1.94

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