

## Needs and Perceptions with Smart Technology Usage in the Elderly Care Facilities

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### ABSTRACT

*The objective of this study is to identify the current state of usage and needs for Smart Technology (ST) in the elderly care facilities based on the point of view of staff members. Using survey via mails, data were analyzed with responses from top- or middle-level staff members working in 171 elderly care facilities located in Seoul, Gyeonggi-do, and Chungcheongnam-do. Results indicated that the most needed smart technology was home automation, followed by nurse call system and health monitoring. The technology with the highest feasibility was health monitoring, followed by nurse call system and video phone. Staff members in higher positions working in the elderly care facilities had the highest expectation in improving the image of their facilities by using ST, while they had low expectation for the fact that ST may increase the locus of control of the elderly. This study implies that ST implementations may vary depending on the level of responsibility of staff members and ST how people responsible for the elderly care facilities subjectively perceive the ST.*

**Key words:** Smart Technology, Elderly Care Facilities, Gerontechnology.

### 1. INTRODUCTION

With rapid aging, there has been an increasing number of older adults and a growing demand for caring for them in South Korea. Currently, older adults over 65 years account for 27.6% of the total population and those over the advanced age of 80 makes up 23.1% of the total population [1]. The number of older adults over 80 years of age increased by 3.6 times (1.316 million) in the last 20 years from 0.365 million in 1994, which accounted for 0.8% of the total population, and is expected to amount to 3.303 million, which will go up by about 10 times after two decades. In particular, the prevalence rate of dementia soars among older adults at the advanced age. The prevalence rate is estimated to grow from 1.3~3.6% among older adults 65-69 of age to 30.5~33.2% among older adults over 85 years old and the estimated cost of dementia care per person stands at 18.51 million won. Given the estimated values, the national cost of dementia treatment and care was about 8.7 trillion won in 2010 and expected to amount to approximately 134.6 trillion

won in 2050 after doubling every 10 years [2]. This means that it is practically inevitable to see an increase in older adults entering the nursing homes even if the sentiment in Korea is hostile to entering such facilities. While the facilities and care workforce for older adults have been expanded with the adoption of the Long-term Care Insurance, there is a lack of information on the services for the families. In addition, the services are not enough to satisfy diverse needs of older adults and their families. This rather leads to the inconsistency between demand and supply. The families are given the new roles to use, adjust, and manage the public services beyond the existing role as a care giver [3], and the care facilities for older adults are focused only on the physical caring by the care workers. Therefore, the quality of care in facilities is insufficient to help psychological and social adaptation of older adults and to meet their needs for the relationship with their families.

On the other hand, there have been studies on the possible benefits of ST in terms of psychological and emotional support as older adults experience difficulties in using products and services for their daily activities due to limited physical and cognitive abilities. And it is believed that ST may enhance older adults' living by assisting their activities. This fact has

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drawn the attention of scholars and healthcare related professionals who work with older adults as it has great potential in improving continuous monitoring and psychosocial functioning [4]. Reference [5] reported that older adults with cognitive difficulties could have improved short-term memories when receiving audiovisual stimulus, and reference [6] reported that older adults' depression and aggression could be reduced depression and that ego control may improve after using computers. Reference [7] found that older adults' memory ability and subjective emotion could be improved by making video autography and sharing it with family. In addition, the best communication method for older adults is the face-to-face communication with family members, friends, and social service workers. The communication over the smart devices or computers can be an alternative to do that. It is reported that older adults who use SNS communicate more with their family and friends compared to the other group [8].

However, the effective application of smart technologies for older adults faces some challenges and concerns such as cost, potential misuses, and retrofitting issues. Therefore, it is most critical to identify the needs of older adults and to find a way to adapt ST in the care facilities for psychological and social support.

As for the needs reported in the previous studies, the study by reference [9] categorized the needs into physiological needs, safety needs, social needs, self-esteem needs and self-realization needs through a web survey with older adults in their 60s. The study selected the planning factors for each ubiquitous housing and collected responses through the survey. Safety needs was the highest followed by physiological and self-esteem needs. More specifically, health checkup, distance health care, and ventilation control were somewhat highly requested for physiological needs; gas detector and fire detector for safety needs; video calls for social needs; and memory prosthesis for self-esteem needs. The survey on the needs for ubiquitous home services for older adults over 55, who can use computers, by reference [10] found that the demands were the highest for emergency call service (4.21), followed by emergency alarm service (4.17), motion detecting and monitoring service (3.97), remote medical examination service (3.96) and automated air conditioning and heating service (3.90). The relatively high physical needs and safety needs such as safety and health were found in previous studies.

Based on the previous studies, this study aims to analyze the relevant factors of the needs of older adults as it is assumed that the ST may improve health and well-being of older adults in the care facilities. However, in determining the current needs of the elderly, it is difficult to collect data from older adults due to their mental/physical limitations and lack of understanding in ST. Therefore, this study intends to explore the possibilities of the smart technologies to improve welfare services for older adults based on the responses by the middle managers or higher who are considered to be able to answer the questions on the needs for and feasibility of the smart technologies based on their understandings on the facilities and field experiences.

## 2. RESEARCH METHODS

To accomplish the research purpose, this study has conducted a survey via mail on implementing Smart Technology in the elderly care facilities. The addresses of facilities (Elderly Group Home and Elderly Nursing Facility) in Seoul, Gyeonggi-do and Chungcheongnam-do listed as Welfare Facilities for the Elderly in 2013 by the Ministry of Health & Welfare were located. A questionnaire explaining the intent of the study and a return envelope were sent to each facility, requesting top- or middle-level staff members to respond. The total 180 facilities sent back the responses: 35 out of 102 elderly group home (34.3% return rate) and 47 out of 139 elderly nursing facilities (33.8% return rate). There are 234 elderly nursing facilities in Seoul and 740 in Gyeonggi-do. The subjects are restricted to facilities with a capacity of at least 50 residents. Among them, the total of 171 facilities were analyzed, excluding those with a considerable amount of omitted responses. The survey began to be distributed via mail in November, 2013, and then it was distributed the second time by fax. Then, additional survey responses were requested to facilities that had not responded, and data collection was completed by the end of December. Data analysis was done using descriptive statistics such as frequency, mean, and standard deviation with SPSS version 19.0.

The results identified: (1) areas in facilities that ST is most needed and specific requirements ST to support care for older adults (2) areas in facilities that ST can be most cost effective (3) areas in facilities where ST is currently used and (4) awareness on ST use and its correlations with other variables.

## 3. RESULTS

### 3.1 Needs for ST in the Elderly Care Facilities (ECF)

The characteristics of facilities and respondents of this study were as follows. See Table 1.

Table 1. Characteristics of ECF and Respondents

	Division	%
Gender	Male	33.3
	Female	66.7
Age	20s	12.7
	30s	26.5
	40s	24.1
	50s	19.9
	60s or above	4.6
	<b>Average (age)</b>	<b>42.5</b>
Level	Top-level	37.4
	Middle-level	62.6
Career experience (year)	Below 3 years	23.4
	3~5 years	46.1
	5 years or above	30.5
	<b>Average (year)</b>	<b>5.3</b>
Year of facility	Below 5 years (after 2008)	67.5

	5 years or above (before 2008)	32.5
	<b>Average (year)</b>	<b>6.0</b>
Region	Seoul	14.1
	Gyeonggi-do	37.6
	Chungnam-do	48.1
Capacity	9 persons or below	18.3
	10~30 persons	11.3
	30~80 persons	40.2
	80 persons or above	30.2
	<b>Average (person)</b>	<b>69.0</b>
Facility type	Elderly group home	20.5
	Elderly nursing facilities	79.5
No. of floors in the facility	1~2 floors	34.7
	3~4 floors	41.8
	5 floors or above	23.5
	<b>Average (floor)</b>	<b>3.1</b>

The ST that was most needed was home automation (39.9%), followed by nurse call system (14.1%) and then health monitoring (11.7%) Table 2.

There was difference in perceived feasibility and necessities of depending on the ST types Health monitoring (16.8%) had the highest feasibility, followed by nurse call system (12.4%), and video phone (10.6%). However, home automation showed the highest necessity while it was perceived to be less feasible. Video phone use or listening to music was considered to be feasible to adapt.

Table 2. Needs for ST in the ECF

[N=171, %]

		1st	2nd	3rd
Health	① Home automation	39.9	9.9	6.8
	② Health monitoring	11.7	20.4	7.5
	③ Remote medical treatment	8.6	4.3	10.6
	④ Remote prescription	6.7	11.1	8.1
Leisure	⑤ Game system with moving	1.2	1.2	3.7
	⑥ Game system with Touch Screen	1.2	2.5	3.7
	⑦ Movie/music player	3.7	5.6	6.8
	⑧ Education/ Counselling	1.8	4.9	4.3
Living / Safety	⑨ Nurse call system	14.1	24.1	13.7
	⑩ Gas detecting system	1.2	0.6	4.3
	⑪ Facilitating daily	5.5	3.1	5.0

	activities			
	⑫ Life information	0.0	1.9	5.0
Family Relation-ship	⑬ Video call (eg:skype)	3.1	5.6	9.9
	⑭ Family blog to share with pictures and movie	1.2	3.1	7.5
	⑮ System to communicate with family	0.0	1.9	3.1

Table 3. Likelihood\* of Using ST in the ECF

[N=171, %]

		1st	2nd	3rd
Health	① Home automation	4.3	5.7	10.9
	② Health monitoring	16.8	11.9	10.2
	③ Remote medical treatment	4.3	3.1	4.1
	④ Remote prescription	5.0	6.9	6.8
Leisure	⑤ Game system with moving	1.2	1.9	4.8
	⑥ Game system with Touch Screen	2.5	3.1	2.0
	⑦ Movie/music player	9.9	10.1	8.2
	⑧ Education/ Counselling	2.5	3.8	6.1
Living / Safety	⑨ Nurse call system	12.4	15.7	7.5
	⑩ Gas detecting system	8.1	3.8	4.1
	⑪ Facilitating daily activities	6.8	6.9	7.5
Family Relation-ship	⑫ Life information	1.9	3.8	6.8
	⑬ Video call (eg:skype)	10.6	6.3	8.2
	⑭ Family blog to share with pictures and movie	9.3	10.7	4.1
	⑮ System to communicate with family	4.3	6.3	8.8

\* ST for the elderly to be considered to adopt.

### 3.2 The rate of adopting ST perceived by staff in the ECF

As Table 4 shows, the rate of adopting ST was the highest in Movie/music player use(38.6%), followed by Gas detecting system(30.4%) and Facilitating/training daily activities (29.8%). It may be because the system for this type of implementation is easy to achieve.

Table 4. ST Adopting Rate in the ECF

[N=171, %(ranking)]

domain	ratio by area			
Health	① Home automation	② Health monitoring	③ Remote medical treatment	④ Remote prescription

	12.9(8)	7.6(10)	1.8(16)	2.3(15)
	Entertainment			Education/Counseling
Leisure	⑤ Game system with moving (eg: Kinect, Wii fit)	⑥ Game system with Touch Screen(eg:U-table)	⑦ Movie/music player	⑧ Education/ Counseling
	6.4(11)	3.5(14)	38.6(1)	15.8(7)
Living / Safety	⑨ Nurse call system	⑩ Gas detecting system	⑪ Facilitating daily activities	⑫ Information Giving System
	21.6(5)	30.4(2)	29.8(3)	5.8(13)
Family Relation-ship	⑬ Video call	⑭ Family blog to share with pictures and movie	⑮ System to communicate with family	
	8.2(9)	22.8(4)	21.1(6)	

Results showed that the ST usage varied through facilities as Table 5 shows. Most of facilities (68.2%) have used 1 or more ST in their facilities while 31.8% of facilities have never used ST. It showed that there was discrepancy in ST uses among facilities.

Table 5. Total Numbers of ST Usage in the ECF

Total Numbers	N	%
None	54	31.8
1	28	16.5
2	19	11.2
3	21	12.4
4	17	10.0
5	17	10.0
6 and more	14	8.1
<b>Total</b>	<b>170</b>	<b>100.0</b>

[N=170, %]

### 3.3 Expectations for benefits by using ST

As Table 6 shows, top- or middle-level staff members expressed a positive expectation that using ST in facilities would bring more benefits to care facilities. Respondents thought using ST could improve the public image of their care facilities.

Table 6. Expectations for benefits by using ST

	Benefits	Mean*	SD
For Care Facilities	1. Saving money (if government would support)	3.64	1.11
	2. Increasing staff's feelings of being effective	3.74	1.05
	3. Making caregiving easier logistically and physically	3.75	1.03
	4. Improving public image of Care Facilities	4.05	.96
For Older Adults	5. Reducing older adults' feelings of depression	3.33	1.06
	6. Reducing older adults' level of stress	3.27	1.07
	7. Make older adults feel safer	3.44	1.08
	8. Make older adults feel more connected to others	3.44	1.08
	9. Make older adults feel more independent	3.18	.93
	10. Make older adults feel to possess more locus of control	3.16	.97
<b>Total</b>		<b>3.51</b>	<b>0.78</b>

[question source] modified from reference [11]

\* Degree of helpfulness from not at all helpful(1) to very helpful(5)

Table 7. Based on Correlation Analysis between study variables

	Total Use of ST	Sex	Age	Position	Facility Region	Facility Type	Facility Capacity	Perceived Needs	Benefits (1)	Benefit2 (2)
Total Use of ST										
Sex	-.008									
Age	.242*	-.108								
Position	-.017	.081	-.492**							
Facility Region	-.071	-.013	.170	-.294**						
Facility Type	-.052	.095	.142	-.304**	.495**					
Facility Capacity	.012	-.022	-.235	.400**	-.625**	-.657**				
Perceived Needs	.100	-.020	.085	-.087	.140	.089	-.180			
Benefits (1)	.168	-.092	-.023	-.145	.067	-.031	-.024	.594***		
Benefit2 (2)	.175	.008	.173	-.193	.073	-.070	-.057	.541***	.585**	
Perceived Benefits (1)+(2)	.184	-.025	.108	-.181	.084	-.061	-.049	.611***	.832**	.937**
M	1.66	1.67	2.87	1.63	2.11	1.61	2.04	36.96	15.24	20.37
SD	.72	.47	1.10	.49	.92	1.21	.79	8.23	3.24	5.01

[Note] Sex (men = 1, women = 2); Position (director = 1, over mid-level staff = 2).

Facility Capacity(1~29=1, 30~79=2, 80+=3), Facility Type(1=Elderly care facility, 2=Elderly group home)

\* p<.05. \*\* p<.01. \*\*\* p<.001.

Results from correlation analysis between variables (Table 7) indicated that the perceived benefits of using ST were significantly related to perceived needs and total usage of technologies. In addition, care facility characteristics was not significantly related to perceptions and current total uses of ST. Respondents who are in top administration positions perceived more benefits of using ST. In conclusion, perceptions of care providers will be critical to promote ST implementations in the ECF in South Korea.

#### 4. CONCLUSION

This study intended to examine the current state of ST usages and perceptions with it in elderly care facilities in South Korea. According to Article 34 of the Welfare of the Older Persons Act, medical and welfare institutions for the elderly include communal living centers and sanatoriums. Amidst the changes in the shift to the information society, ST devices are expanding its uses in various areas in society, which finally reached to the field of welfare. However, there is still no research on their usage of ST in Korea. Thus, this study conducted a survey via mail targeting middle- or high level managers in the Elderly Care Facilities located in Seoul, Gyeonggi-do, and Chungcheongnam-do.

The first major finding of the study indicates that the most needed ST from the staff's point of view was home automation, followed by nurse call system and health monitoring. The ST with the highest perceived feasibility was health monitoring, followed by nurse call system and video phone. The demands for ST in living/safety areas were generally in line with the previous research [9], [10], [12], [13]. This result may be due to the fact that costs incur in implementing ST such as nurse call system or video phone. And so, ST types that are more easily achievable with less cost are likely to be implemented. This is even more apparent in the actual and current s at facilities. The technologies actually needed but not very feasible had a low level of implementations, while music or movie players, a gas detector, or photo or video sharing device turned out to have a high level of implementations. The study by reference [13] mentioned the family photo view, video play and video call as the most helpful ST application for older adults to support family relationships among the caregivers in the nursing homes. Given the results, there are possibilities to adopt the smart technologies in such areas.

In addition to the finding about ST needs, this study showed facility staff working in elderly care facilities in middle or higher position had the highest expectation for improving the image of their facilities by using ST, while they had low expectation for the fact that ST may increase ego control of the elderly. Correlation results show that perception on ST uses was related the total number of devices used, but unrelated to the other characteristics in their facilities. Moreover, the respondents with higher responsibilities perceived higher level of ST usefulness, indicating that the level of staff positions may influence perceptions of ST usefulness. This result implies positive future of ST adoption to ECF in Korea. Korea ranks first in the broadband adoption rate of 94%, first in average internet connection speed, third in the number of wire

telephone line per 1,000 persons of the total population, and 5th in the number of the members of wire broadband services per 1,000 persons of the total population [14] and has well-established infrastructure for supporting to use the smart devices. Therefore, if ST ideal to Korean society is developed that can address specific needs that older adults in South Korea have, it is very likely to be useful to support older adults socially and psychologically.

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