

An Exploratory Study on Consumer's Needs on Smart Home in Korea

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Abstract. In the middle of transformation to IoT society, interests on smart home services are increasing. While the needs on smart home can be different by culture and lifestyle, there are only a few studies on smart home user experiences in Korean situation.

Six focus group discussions (FGD) were conducted and the main findings were as follows; first of all, whereas smart home is still new concept for general consumers and IoT is felt rather far from their everyday lives, smart home services with tangible benefits were acceptable. In addition, the adoption of smart home is related with user's lifestyle. However, concerns on customer care and privacy are critical barriers for its adoption.

In the new era of IoT, it is important to understand consumer's attitudes and experiences towards smart home services. The service providers are encouraged to plan and develop the user oriented services and marketing communications.

Keywords: Smart home · Home IoT · Korean case study · Consumer needs

1 Introduction

In the middle of transformation to IoT society, interests on smart home services are increasing from both consumer and industry sides. Smart home is defined as “a residence equipped with technology that facilitates monitoring of residents and/or promotes independence and increases residents' quality of life [1]”. Recently, the concept of smart home services is being expanded to various smart devices which is located at home and can be self-automated, remote-controlled through mobile phone or PC outside home.

Among various industries utilizing IoT, smart home services are expected to have a great growth potential in near future. Gartner even forecasted that “a typical family home could contain more than 500 smart devices by 2022 [2]”. Telecommunication industries are also very interested in smart home market. Verizon Wireless and AT&T in the United States and NTT docomo in Japan are already providing smart home service in each region. In the United States, for example, where the detached houses are popular, smart home services are being evolved focusing on the home security related services.

In Korea, domestic telecommunication service providers such as SK telecom, KT and LG U+ started to launch smart home services in 2015 spring such as home monitoring camera, gas locking service, door locking service, remote-controlled boiler and dehumidifier, etc. LG U+ was reported that the number of Home IoT service monthly subscriptions were more than 100 thousand households [3].

Though it is important to understand consumers' attitudes and lifestyle related with smart home for user oriented technology development, most of researches have been focused on smart home in the perspective of elderly care in the aging and aged society ([4-7]). Only a few studies started to explore young and middle-aged consumers' perceptions towards smart home and the use cases ([8]). Moreover, while the needs on smart home can be different by culture and lifestyle, studies on smart home user experiences in Korean situation were rarely visited.

This paper aims to explore consumer's general perception on smart home and to discover triggers and barriers for smart home adoption by households. The article begins with background of this study including the definition of smart home and a brief literature review on smart home. Subsequently, findings from focus group discussion conducted in Korea were reported. Finally, implications and suggestions for further research are provided.

2 Background

2.1 The Definition of Smart Home

In accordance with the traditional concept of automated and/or ubiquitous home, a smart home has been defined as "a residence equipped with a communications network, linking sensors and domestic devices and appliances which can be remotely monitored, accessed or controlled and which provides services that respond to the needs of its inhabitants ([5, 6, 8])".

Smart home services, which pursue comfortable, safe, economic and pleasant life, are classified into six sub categories by its value such as smart home appliances, home automation, security, healthcare, green home, and smart TV & home entertainment service [9]. Smart home services related with home security and automation have been dominant because safety is the most important basic function of human value especially at home or personal/families' shelter.

2.2 Research Review

Except studies on elderly people's needs on smart home, most of prior researches on smart home were focused on housewives' needs. This is because smart home services are being established at home, which is traditionally perceived as female's territory. However, a recent research [10] showed that smart home can be adopted by various user segments, such as female housewives, male, elderly people and young generation in 20's. Another study in Korea [11] also showed that single female household had high interests on smart home CCTV in the perspective of security.

In addition, a Qualitative study [8], which was conducted in three European countries, UK, Germany and Italy, reported that tangible benefits and increases of quality of live will be the drivers for smart home development. But the potential barriers of smart home service adoptions existed such as lack of understanding of smart home technology, concerns on technology failure or difficulties in use, privacy and/or security concern, and loss of consumer freedom.

3 Methods

This study adopted focus group discussion to explore consumers' perceptions in a qualitative way. Six focus groups were conducted with 37 participants from Seoul metropolitan area in Korea (see Table 1). Each session of FGD consisted of 4 to 7 consumers. Two focus groups were consisted of smart home users who are currently using one or more smart home services and other four focus groups were targeting potential customers. Three intender group of smart home and one low interest group discussion were conducted and intender groups were consisted of three household types; single household, newly wedded couple and household with children. All six focus group sessions were conducted in October 2015.

The participants were recruited through a marketing research agency and paid incentive money in order to compensate their time. Prior to discussion, every consumer was well informed of research background, main discussion agendas, gratitude provision and signed a nondisclosure agreement and a declaration of consent agreeing to be recorded to allow the voice to be scripted only for research purposes. The participants were also informed that all comments were recorded but would be anonymized prior to analysis.

Each group session consisted of two parts; the first part was focused on consumer perceptions and expectations towards smart home and the second part focused on the real use cases, triggers and barriers of smart home adoption. Whereas intender group discussions were more focused on their perceptions and expectations towards smart home, user group discussions were more focused on their real use cases, and perceived values and pain points. All the six discussion sessions were transcribed and an iterative analysis between the transcripts was conducted to discover the common themes of consumer perceptions and attitudes to smart home.

4 Results

4.1 Perceptions on Smart Home

The participants identified a wide range of issues which fits into three themes as Table 1 summarizes. The three themes included general concept of smart home services, perceived values of smart home, and concerns on smart home technology. Firstly, most of participants mentioned "automatic", "remote control", "controllable outside", "always connected", and "ubiquitous."

Table 1. Group participant profile

No.	Group characteristics	Number of people
1	User group 1 : Telco smart home	5
2	User group 2 : Non-Telco smart home	4
3	Intention group 1 : Single family	7
4	Intention group 2 : Newly wed	7
5	Intention group 3 : Family w/children	7
6	Low interest group	7

Intender groups felt more positive towards smart home services with describing it as “advanced”, “sophisticated”, “up to date”, and “cutting edge”, technology”. Among intender group, there were differences between households in a family with children and households in a single family or newly wedded couple without a child. Whereas housewives in a family with children valued smart home as a device which is helpful, comfortable, caring for everything in the household, and is able to provide spare time with lessening the burdens of household chores, single family and newly wedded couples were mostly focused on the value of safety, and relief from anxiety on security (Table 2).

In the other hands, low interest group mentioned rather negative expressions towards smart home services such as “unfamiliar”, “not yet”, “unbelievable”, “untrustworthy”, “vague”, and “frustrated”. In addition to malfunction and privacy concerns which were mentioned by every group, low interest group showed ethical concerns on smart home services such as human alienation.

Table 2. Perceptions on smart home

		Intender			Low interest group
		Single household	Newly wedded couple	Family with children	
Concept & basic attributes	Automatic	√	√	√	√
	Remote control	√	√	√	√
	Always connected		√		
	Ubiquitous		√		
	Fast/speed	√	√		√
	Convenient	√	√	√	√
	Efficient	√			√
	Time saving			√	√
	Cost saving	√			
	Customized	√			

(Continued)

Table 2. (Continued)

		Intender			Low interest group
		Single household	Newly wedded couple	Family with children	
Positive values	Advanced	√	√	√	
	Up to date	√	√	√	
	Sophisticated			√	
	Cutting edge		√		
	Relief, security	√	√		
	Helpful			√	
	Showing off			√	
	Spare time			√	
	Care for everything			√	
General concerns on smart home	Malfunction	√	√	√	√
	Not necessary		√	√	√
	Planned obsolescence		√	√	
	Untrustworthy			√	√
	Unfamiliar				√
	Vague				√
	Unbelievable				√
	Frustrated				√
	Hard to use				√

(Concerns on smart home by low interest group)

"It should be useful but what shall I do if machines do all the things? What do I live for? Machines do too many things and would overwhelm us."

"It is really efficient but people may lose their memory, as we can't remember the phone number after using a smart phone. My movement will also decrease if every activity is substituted by artificial intelligence."

"It would be scaring if everything is controlled by technology. I just want to get a help when I asked to do it. I need the right of choice as a master of my home. I am not a puppet."

4.2 Triggers and Barriers of Smart Home Adoption

Whereas smart home is still new concept for general consumers and IoT is felt rather far from their everyday lives, smart home services with tangible benefits were acceptable. The main triggers for smart home adoption was as follows; first of all, Users felt satisfaction more on frequently used smart home services such as automatic

gas locking services, because consumers felt it useful when it is related with their daily concern or anxiety such as gas leak. The core benefit of the smart home service is relief from the concern and anxiety, which were traditionally thought as uncontrollable.

(Gas locking service use cases)

"I use the gas locking service several times even in a day. When I am not sure if I closed the gas valve right after getting out of the kitchen, I just check it through my smart phone. I can solve my issues even without walking a few steps, which is very useful and satisfying."

"My mother always forgets to close the gas valve and I am really relieved from the anxiety with the gas locking service."

In addition, the adoption of smart home is related with user's lifestyle. For example, pet owners felt home monitoring cameras and automatic adjustable lighting useful when they were on vacation or out of home leaving their pet at home where their pet is very used to. They were able to watch and give a talk to pet and even turn on and off the lights in the evening and in the morning when they are travelling abroad. While self-adjusting thermostat and boiler were welcomed by families with a baby or little kids to adjust temperature and make home cozy right before they arrived home from outside, remote controlled gas locking service were a cool factor for working housewives and elderly families.

(CCTV use cases)

"It is really innovative to use CCTV for home security, which is never imaginable 10 year ago. I live alone in a detached house and always had concern on robbery/theft of parcel delivery before installing CCTV. I feel secure now."

"CCTV is very useful because there is a baby and a pet as well in my family, because I can take care of them partially even when I am out of home."

(Automatic adjustable lightening use cases)

"My dog is too shy to leave it at the dog hotel while I am out of home. She feels rather comfortable at home but is afraid of darkness. Automatic adjustable lighting is very useful in this situation. If my trip is not longer than 2 days, she rather wants to stay at home. I leave enough food and turn on the light at night and off in the morning."

Whereas smart home provides convenient life for consumers, there also exist some barriers for its adoption. It was hard to figure out the exact reason when malfunctions happened. Secure internet broadband services and electricity is prerequisite of smart home service. In addition, responsive customer feedback & repair is required to avoid embarrassing experiences, if smart home is aiming to be a life platform. For instance, one pet owner confessed they had to come back home to take their pet in the middle of their journey when the smart home app didn't work well outside.

(Embarrassing experiences with system malfunction)

"It happened in the new year's day last year. We were in the middle of journey to my parents' home for a short visiting trip without taking my pet. But when I tried to access the smart home

system provided by our apartment, it didn't work well. Though I made several calls to the office, there was no way to solve it because it happened during the big national holidays. We had to come back to home to take my dog. I was really embarrassed."

(Concern on after sales service)

"When the smart home application doesn't work, it may be hard to know what the real issue is. Various problems can be considered such as WiFi disconnection, application error, or malfunction of sensors embedded in the smart home appliances. If we need to contact each service provider separately, it would be very painful. All the communication channels should be integrated into single source for a quicker resolution."

Privacy and user information protection is another concern. Whereas the home monitoring camera is very useful for pet care and security, there is a trade-off between the usefulness and the privacy safety. There should be a possibility of 3rd person access to recorded images, which has to be saved somewhere in the cloud storage for the mobile phone access.

(Privacy concerns on CCTV)

"Convenience always goes with dangerousness, never safe. Every moment in my house is recorded and can be accessed through my smart phone and laptop, which means that anyone can access it."

4.3 Expectations Towards Smart Home

When consumers were asked about their expectations towards smart home in near future, most of their imaginations were related with smart home appliances and home automation. Smart home appliances which can be controlled from outside were said to be useful for families with children.

(An expectation on a smart microwave oven)

"When I am late, my child sometimes uses microwave oven for herself. I am always afraid of her being injured. Hope that I can cook from outside and let her have it after checking the temperature."

(An expectation on a smart air purifier)

"For families with children or little babies, automotive air purifier will be very useful, which is enable to measure the amount of indoor fine dust and purify air. The automatic control of temperature and humidity would be also beneficial for families with little babies."

Smart home appliances were also attractive even to single families and newly wedded couples without children. They had interests in doing household chores such as laundry washing, vacuum cleaning or grocery shopping outside home to save their time.

(An expectation on a smart washer)

"I am almost outside during day time and have trouble to find time for laundry washing, because washing laundries at night time is not recommended in apartments. I hope that I can

do laundries when I am out of home or one hour before I come home through smart home services.”

(An expectation on a smart refrigerator)

“I always do grocery shopping in the mobile shopping mall while I am commuting and sometimes have no ideas what I have in my refrigerator. I expect a smart refrigerator which informs me of grocery shopping items or allows smart home services to do grocery shopping based upon information gathered by scanning the quantities and/or status of food items in the refrigerators.”

Whereas families with children, single families and newly wedded couples liked the remote control function of smart home, FGD participants recommended smart home to elderly families or households with disabled because of home automation function of smart home.

(Smart home recommendations to elderly or disabled people)

“It is likely to be more useful for elderly families or households with disabled persons but they may feel uncomfortable with it. For elderly or disabled people, automated control would be rather useful than remote control.”

5 Discussions

In the new era of IoT, it is critical to understand consumer’s attitudes and experiences towards the newly introduced smart home services. This research aimed to provide exploratory views of smart home service user’s experiences in the Korean context for a user-oriented smart home service design. Families with children showed the biggest interests on smart home services but busy single families and newly wedded couples were also interested in smart home if they are well informed based upon their lifestyle needs. It is time to call further researches on smart home to discover user’s basic needs on the smart home by various consumer segments and to encourage the service providers to plan and develop the user oriented services and marketing communications.

Moreover, it is important to provide universal service design for the smart home market formation, which is compatible with all peripheral devices and products regardless of the OS and manufacturers. In Korea, for example, the market share of android phone is much higher than that of IOS and the smart home services are mostly customized for android OS. It would be also painful if users need to download several smart home apps for each product or service. Users are not able to purchase all their home appliances from the same manufacturers to make them connected, either. The most compatible and integrated service design will be the key success factor of smart home.

In the future researches, influencing factors on smart home adoption need to be discovered in the perspective of consumer psychology such as technology acceptance or technology readiness, etc. In addition, it is important to explore smart home user’s experience in their daily life contexts to design the most easy to use smart home platform.

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