

**THAI CONSUMER CONCERNS REGARDING AGING IN
HOME AND HEALTH MONITORING TECHNOLOGIES**



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Thematic paper
entitled
**THAI CONSUMER CONCERNS REGARDING AGING IN
HOME AND HEALTH MONITORING TECHNOLOGIES**

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.....
Assist. Prof. Randall Shannon,
Ph.D.
Advisor

.....
Ms. Narumon Nualplaud
Candidate

.....
Assist. Prof. Astrid Kainzbauer,
Ph.D.
Committee member

.....
Assoc. Prof. Vichita Ractham,
Ph.D.
Chairperson

.....
Duangporn Arbhasil,
Ph.D.
Dean, College of Management
Mahidol University

.....
Worapong Janyangyuen,
D.B.A.
Committee member

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Narumon Nualplaud

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NARUMON NUALPLAUD 5849030

M.M. (GENERAL MANAGEMENT)

THEMATIC PAPER ADVISORY COMMITTEE: ASST. PROF. RANDALL SHANNON, Ph.D., ASSOC. PROF. VICHITA RACTHAM, Ph.D., WORAPONG JANYANGYUEN, D.B.A.

ABSTRACT

Population aging trillions is the mega trend, no other forces likely to shape the health of economy as the irreversible rate in which the world population is aging. In the last decade, Thailand is the most rapid population aging among the developing world. More and more we see in our community is the need to stay independent and aged respectfully as possible. A successful adoption of technologies to help elderly's autonomy requires appreciation of needs and perceptions. The research aims to explore the ideal key components to be able to age in place including the perceptions of Thai consumers both older adults and family in using technology to monitor health conditions. The qualitative research conducted with 37 participants residing in Bangkok by in-depth interview method. Overall, safety in own shelter, healthiness, and financial stability were the top priorities in order to be happily aging in home. The result showed positive perception toward health monitoring technologies while participants were concerned about cost, privacy, loneliness, and user-friendliness of technology. It was suggested that by embracing technology to ensure basic human needs, giving Thai consumers real control of their own health and living, making monitoring technologies more human-centered rather than system-centered with suitable cost structure, the willingness of adoption of these technologies would be increased. Aging in home brings opportunity of emerging community and smart solutions can be an option to reduce long-term medical costs for Thai government regarding Thailand aging society.

KEY WORDS: Aging in Home/ Smart Home for Thai Seniors / Smart Solutions for Health Monitoring / Perceptions of Technologies for Seniors

52 pages

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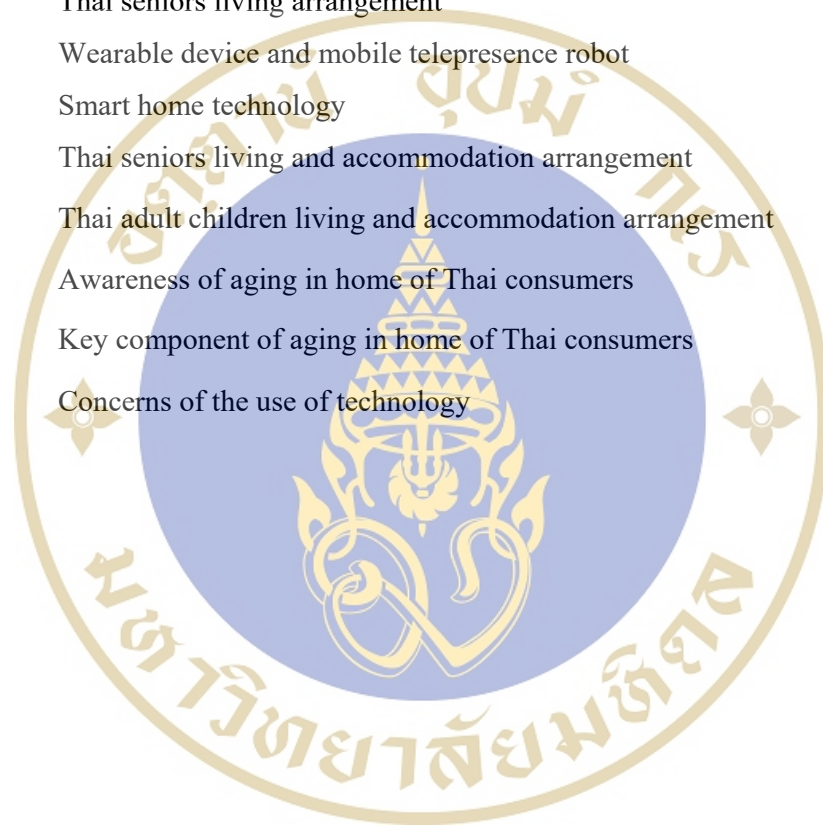
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CHAPTER I

INTRODUCTION

Asian societies are aging. Besides Thailand is aging rapidly. The World Bank report 2015 shows more than 7 million people or over 10 percent of the Thai population are 65 years old or older as of 2015. By 2040, a number of 17 million Thais above 65 years of age is projected which counts as more than a quarter of the population.

Thailand made a success of social and economic development by moving from a low-income country to an upper-middle income economy in 2011. The more development success in Thailand, the longer life expectancy of Thai people are. Advanced performance improvement in healthcare services and medical technologies causes people live longer and fertility has fallen rapidly. During the past several decades, Thailand has been one of the most successful countries in bringing down its fertility level within a short period of time. The total fertility rate has declined from over 6 births per woman in the mid-1960s to below 2 in the mid-1990s. During the same period, life expectancy at birth increased from 55.2 years to 69.9 years for men and 61.8 years to 74.9 years for women. In the coming decades, besides the lowering of the growth rate, a major demographic consequence of this rapid fertility reduction will be an inevitable aging of the population. Even more dramatic will be the rapid increase in the absolute size of the older population (aged 60 and over), a result of past high fertility levels and substantial declines of mortality. With no exception, the portion of young population decrease over time. The working-age population is projected to decline by 10 percent in 2040 while the proportion of aging population over 65 years old grow larger. Thailand is currently in point that people get old before they get rich. Success brings aging, so do other developing Asian countries.

The number of older persons (defined as aged 60 and over) in Thailand has grown rapidly and will continue to do so in future decades. Since 1960 the number of older people in the Thai population has increased seven-fold from approximately 1.5 million to 10.7 million by 2015 or 16% of the total population. Future population aging

will occur even more rapidly with the number of older persons projected to increase to over 20 million by 2035, at which point they will constitute over 30% of the population. Within the next few years, persons 60 and older will outnumber children under age 15 for the first time in Thai history.

Currently, Thailand is experiencing among the most rapid rates of population aging in the developing world. The rapidity of the current change in Thailand stands in contrast to historical developments in most Western countries. This implies that the country will face emergent issues related to social security, health care costs and intergenerational equity and so on in a far shorter time span than that happened in the West. These issues require appropriate policy and program development to deal with. Hence, it is imperative that Thailand has a well prepared national policy and program on aging as well as for long-term care services for older persons.

What should be the predictions for the future Thai seniors living and trends? Thailand is a collectivist society according to Hofstede's cultural dimensions theory. Thailand ranks 20 in the individualism versus collectivism chart, while the score of 91 of the United States of America indicates the independence as core values. The sense of collectivism in Thailand is about the family commitment. Family plays an important role in Thai society which affects Thais to be in groups to feel protected. Thai people are concerned about the relationship among others. Close ties between extended families and communities can have a major influence on individual behavior in Thailand and often there are multiple generations living under one roof. In past decades, the modern concept of Thai family deliberately transformed its structure, more and more modern couples live separately from their parents. Thai elderly people are more likely to live alone.

As people grow older, they strongly wish to continue living in own houses safely, independently, and comfortably regardless the age, income or physical ability. Moving towards digitalization era, home automation and internet of things are using technology to complete housework or household activities automatically with no intervention from the user. A smart solution allows an individual to have remote control of performing the activities. The goal of home automation is to help creating a home that is easier, more enjoyable, and safe to live. Aging in place can benefit from applying this technology for the elders or disabled and also add health monitoring functions,

making a senior's home safer while allowing them to stay longer in their home or within a care center community. It can be used as an alternative to keep seniors and family connected. Smart home concepts gained a lot of interest in 21st century. The future of home monitoring devices holds a lot of promises. There are now many home systems and related devices that enable seniors to live in their own homes longer and still connect to emergency networks if necessary. Tablet computers, wearable alarm systems, home security systems, health tracking gadgets, monitoring services, and medication dispensing systems are six simple technologies that are helping elders to live more independently at home. On the other hand, aging in place can be dangerous when seniors interact with their home environments with different degree of cognitive or physical disabilities. Nonetheless E-surveillance system for seniors is considered as a destruction of privacy of being observed.

The aims of this study are to assess the awareness and expectations of Thai consumers both seniors above 60 years old and family in regard to ability to be aged in home. Furthermore, this study seeks the perceptions, attitudes, and concerns towards smart health monitoring technologies which contribute to social and emotional well-being including capacity to continue participating in outside interests and activities. These are to determine whether the independent living seniors would be willing to have monitoring technology in their homes. The three selected innovative health monitoring technologies in this research are used as samples for interviewing the participants. The technologies are wearable device, mobile telepresence robot, and smart home system.

CHAPTER II

LITERATURE REVIEW

2.1 Elderly Thais living arrangement

The World Health Organization (WHO), reports remarkable increase over the past decades in elderly population in the world. In 2050, the number of people aged 60 and older is predicted to reach about 2 billion in total of the world's population (<http://www.who.int/features/factfiles/ageing/en/>, 2014). As defined by MeSH, a broad definition of “older people” is adopted. ‘Middle-aged’ is a person who ages 45-64 years, while 65-79 years old adult is called ‘aged’ and ‘aged 80 and over years’. (Park H, et. al, 2011). In Thailand, the retirement age has been fixed at 60 years since 1941 under the Pension Act. Throughout this study, any participants age 60 years or older will be considered for the systematic review and defined as “Senior”.

Compared with the United States of America where the core values are the declaration of independence, the freedom and equality including the human rights. The direct and straightforward communication style making Americans are confident in themselves. They prefer working and living alone and apart from their parents because Americans' lifestyles are motivated by personal ambition and success. This individualistic personality ranks score of 91 in the individualism versus collectivism (Hofstede, n.d.). Thailand ranks 20 in this chart which shows that Thailand is intensely collectivistic society. Thai people have the commitment to family and relationship among others (Hofstede, n.d.). The sense of collectivism affects Thai people attitudes in term of being in groups to feel protected. The group members are connected by stronger relationship than people outside their groups. Thais help each other to achieve their goals and objectives as the concept of patronage system (Streckfuss, 2009). Because Thai people are taught to help others and concern others' feelings, it always makes them think for others rather than themselves especially for family members.

Thai society's traditional basic structure is extended family with several generations living under one roof. Throughout their life, Thai children are able to learn

code of conduct and behaviors through the seniors and parental guidance. On the contrary, older age parents living with one or more adult children is stereotyped as an essential way to meet elders' requirement of support, assistance, and caring from others.

Unlike in the past, Thailand family institution is facing many challenges which result in transformation to nuclear family. In the present world, a typical Thai family comprises parents and no more than two children. Family and young married couples imbed in the city. Trends are changing the landscape of human settlement, enlarging the urbanization.

Since 1986, the number of Thai seniors living alone or only with a spouse have increased steadily. Co-residence of elderly parents who are sixty-five years old and older and their adult children reduce from 71 percent in 1995 to 55 percent in 2014. (John Knodel et. al, 2015). In 2014, Sixty percent of seniors live together with their adult children. Twenty eight percent of older persons lived independently or only with their spouse without geographically distanced from family members. Approximately twelve percent of elders who live alone or only with a spouse have adult children living next door or within the same locality (John Knodel et. al, 2015). As a strong collectivist society, Thais live more independently surrounding by families and relatives. Simultaneously family always want to know that their beloved elders are being well and enjoy the day at home.

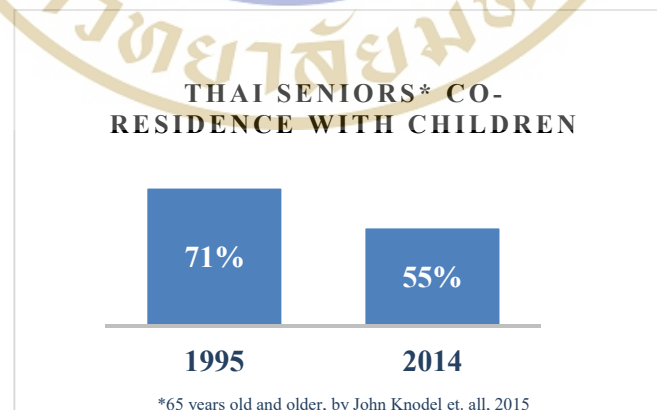


Figure 2.1 Thai seniors co-residence with children

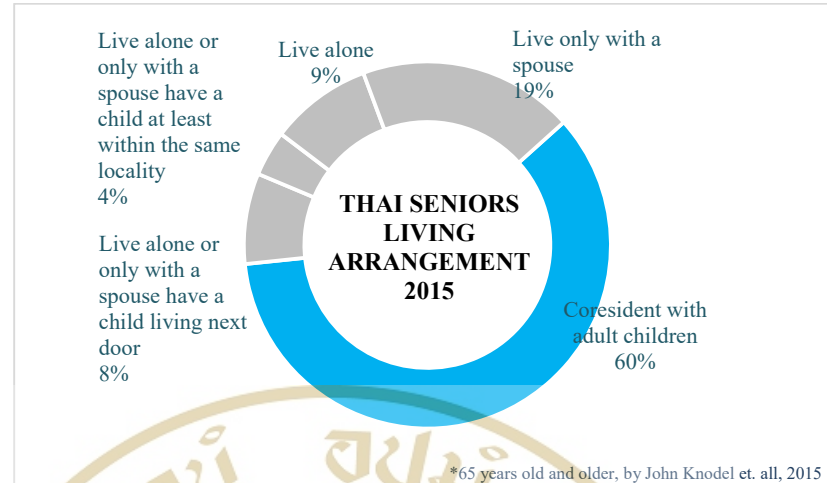


Figure 2.2 Thai Seniors Living Arrangement

2.2 Aging in place

As people age, many older adults prefer to continue living in their own homes where the specific challenges they face are unpredictable. (Fausset et al., 2011). The literature universally defined aging in place as the ability to stay in one's own home as a person ages (Cutchin, 2003; Kunstler, 2002; Lanspery&Hyde, 1997). Likewise it has been defined by the U.S. Centers for Disease Control and Prevention as "the ability to live in one's own home and community safely, independently, and comfortably, regardless of age, income, or ability level.

To live independently and being aged in place, it involves continuous interaction between the person and the changing environment. Older adults must maintain various daily activities within the home. Not only Activities of Daily Living (ADLs) or DEATH; Dressing, Eating, Ambulation, Toileting, and Hygiene or bathing (Lawton, 1990) are essential for independent survival. But also the elders must be able to perform the higher functioning activities or Instrumental Activities of Daily Living (IADLs) required for maintaining mental independence which includes SHAFT; Shopping, Housekeeping, Accounting, Food preparation and medications, and Transportation (Lawton, 1990). It remains to be investigated how older adults achieve the goal of maintaining their aging in home beyond the challenges of basic and instrumental activities of daily living.

2.3 Technology to help aging in place

The world is more connected than ever. Globalization which global goods trade and cross-border capital flows is currently changing. World is entering a new phase as “digital flows” where flows of data and information are identified. The digitization is phenomenon and reaching human lives. Computers, the Internet, mobile phones, social networking, and texting increase the familiarity with technology. It transforms how a person work, consume, and desire to be in contact with huge networks of family members, friends, and business contacts on Internet and mobile communications.

The Postscapes information service predicted that by 2020, approximately 50 billion devices around the world will be connected to the Internet. One third are computers, smartphones, tablets, and TVs whereas the two-thirds will be other kinds like sensors, actuators, and newly invented intelligent “things” that monitor, control, analyze, and optimize the world. The Internet of Things (IoT) is decades-long technology to serve the needs of monitoring and controlling the physical environment in which people work and play. The “things” in daily life will be equipped with microcontroller, sensors, and suitable protocol that make them able to communicate with one another when the users become integral part of the Internet. It incorporates other major technology industry trends such as mobile communications, cloud computing, data analytics, and beyond.

Internet of Things connects people with technology utilizing the flow of information (Couturier et. al, 2012). The concept uses Internet to enable easy access to a wide variety of devices such as home appliances, CCTV, and health care monitoring system (Zanella et. al, 2014). In order to ensure senior adults’ independent living and aging in place, IoT emerges various portable health monitoring devices and in-home care surveillance technology. One solution is gathering physiological and movement data and sending notification in situations for examples when a senior requires assistance of taking medications or to assure the prompt involvement of health care providers and family in case of an emergency. Second is bridging the distance of elders and friends, family members, and a doctor and healthcare facility. It offers lesser visits to provide medical checks and adaptive support in relation to age-related impairments

especially for those who have chronic disease and need daily observation. Third is to sense and learn the daily routines of elderly people in ambient sensing environments including track declining trends of functional abilities over time. Possible health deterioration is analyzed at the early stage, delay illnesses from aging, and promote a healthy lifestyle as a long-term care service options. The basic IoT embedded devices for health monitoring have existed for years. It ranges from the small GPS tracking, wearable devices, through the surveillance robots, and smart home automation technology such as thermostats that sense ambient temperature and control heating and cooling systems.

Looking back in Thailand, the country had 38 million active internet users in 2015. As well as Google, which is the dominant search engine in Thailand, social media outlets Facebook and Line each have a massive Thai user base with over 35 million users. Thailand is in the midst of transformation to the digital economy which opens the opportunity to adopt the following existing technologies for aging in place.

2.3.1 Wearable devices

For easier life of both seniors and caregivers, wearable devices for elders can be one of the options. This advance healthcare technology are not only basic trackers but also monitor daily activities, send alerts, and perform falls prevention. Wearable sensors are able to sense and store health records, diagnose, and save elders' life in emergency situations. The devices can be used to remind seniors to take their medicine at appropriate intervals, for example, by reading information transmitted by the added smart labels on the drugs which show consumers on dosage and expiration date. (Sundmaeker et al., 2010; European Commission, 2008).

The wearable devices play important role in enhancement of the quality of life not only for the elders but also handicapped and patients with chronic diseases (Park&Jayaraman, 2010). In China, a look at what best practices shows a reduction in healthcare costs. Using wearable systems introduced preventive healthcare strategies, eliminated unnecessary health services, streamlined diagnostic processed, rip redundant medical equipment, time, and labor costs, (Poon & Zhang, 2008).

2.3.2 Mobile telepresence robot

Unlike a traditional videoconferencing or telepresence solution in offices, mobile telepresence robot is personal “avatar” to bridge the distance between seniors with the caregivers or the loved ones. It combines video conferencing equipment with mobile robots which can be activated from remote locations. Having robots in homes helps older adults who prefer to age in their home settings to perform tasks they need or want assistance. The mobile robots are designed for physically assisting older adults on DEATH and SHAFT (Hansen et. al, 2010, Helal&Abdulrazak, 2006). Nonetheless it functions and acts like a social partner (Heerink et.al, 2006) since it was designed to be tele-operated to improve communication between individuals.

When the seniors live alone, another approach is to use robots to foster social interaction between people. Mobile telepresence robots, equipped with video camera, display, microphone and speakers, and touch screen, can move around in the home by somebody’s control and send data to a caregiver when it is connected over Internet while maintain elders social contacts talking and communicating with robots. The intelligent system, links to the mobile robot, consists of home sensor network use for blood pressure & temperature measuring, or detecting when senior occupies a chair, moves or falls then interpret as activities, health and wellbeing which are useful off line information for a health professional. The night activities such as person is going to bed or a fall can then trigger emergency alarms or remind the family and caregivers (Coradeschi et. all, 2013). Mobile telepresence robots maintain older adults independence, reduce healthcare needs, provide everyday assistance, and promote social interaction.

2.3.3 Ambient Assisted Living (AAL) and Smart home technology

Ambient Assisted Living (AAL) supports the autonomy elderly people and people with special daily cares and ensure their safety lifestyle in own home environment (Dohr et. all, 2010).

AAL begins with basic data acquisition by sensors to high-level data integration with both data-driven and knowledge-driven approaches. Moving into the digital age, a variety of assistive technologies have been developed to empower people’s capabilities to survive under sensitive, adaptive, and responsive environments

(Acampora et. al, 2013). To enable safety and wellbeing in one's home, the home has to be intelligent with the help of smart items. That is the vision of Ambient Intelligence. Seniors perform different types of activities both in home and outside. If all activities are correctly and automatically identified e.g. "preparing a meal", "taking a bath" or "watch television while sitting on the sofa", a wide range of applications and services become possible with monitoring activities of daily life and recommending services for active lifestyle (Ali et. all, 2015). Concrete examples of applications can be found in a mobile emergency response system (Lloret et. al, 2015), a fall detection system (Aghajan et. al, 2007), early disease detection, professional advice on routine lifestyle, health status monitoring and help in treatment prescription.

AAL initially functions as a combination between the wearable devices and the mobile telepresence robot, a set of sensors will be installed inside the home, located in different locations for instance walls and doors, furniture, appliances, toilet and bathroom, garage, etc. The senior's health conditions and daily behaviors are monitored and analyzed by the sensor in bed or bathroom as routine pattern which benefits to medication management and reminders. Apart from the embedded sensors, other sensing devices may be "worn" by the elderly attached to their bodies either directly or indirectly e.g. a smartphone that is carried in a pocket. Different type of sensors are synchronously required to precisely identify the different activities. Each sensors provide the raw data measurements in the particular form. The preprocessing of data is essential in order to acquire useful and significant information for the application. Sensor technology can actualize an efficient smart services delivery platform for seniors and further to public by planting sensors in houses and the cities to create information sharing platforms. The platform itself consists of data warehouse to store the individual information of different sensor system which is beneficial for proper use to the public, businesses, professionals, and government agency.

Not only behaviors and health detections, intelligence home environment also allows the seniors to be able to control their home environment, light, locks, temperature, surveillance system. AAL technologies provide help with daily activities, based on monitoring activities of daily living (ADL) and issuing reminders as well as helping with mobility and automation. Finally, such technologies bring older adults the

better connection and communication with their peers, as well as with their family and friends.

With respect to the fields of needs for elderly people, for example, The monitoring of chronic illnesses (health), on-demand provision with fresh food (safety), alarming systems (security), reminder services (peace of mind) and enabling communication with relatives and caregivers (social contact), it is possible to accomplish all fields through the IoT technology make home smarter by being context-sensitive, connected, and adaptive. (Dohr et. all, 2010). Things are becoming more integrated with the human body and communicate with doctors, emergency services center, as well as other health providers (Guillemin & Freiss, 2009). In US, some concepts of smart home for medicine is equipped with infrared sensors, biosensors, computers and video cameras to collect the data that will augment the data collected by physicians and hospitals. Other concept is smart in-home monitoring system developed in-home monitoring of residents using a set of non-invasive sensors together with data-logging and communication module and data management system in order to increase quality of care and provide quality of life indicators (Alwan, M., et. all, 2006).

Smart home with the foundation of IoT will enable the seniors to stay longer and safer at home since smart devices can alarm the hospital in case of critical situations. Furthermore due to constant monitoring, the seniors can be relieved from the hassle of routine checks when they feel better, replacing costly travel and reducing seniors stress (European Commission, 2008). Smart home technology helps preventing, curing, and improving wellness and health conditions of older adults. The collected data can be used for the observation of general health and activity level, activities of daily living (ADL), index of well-being and the decline in ability over time.

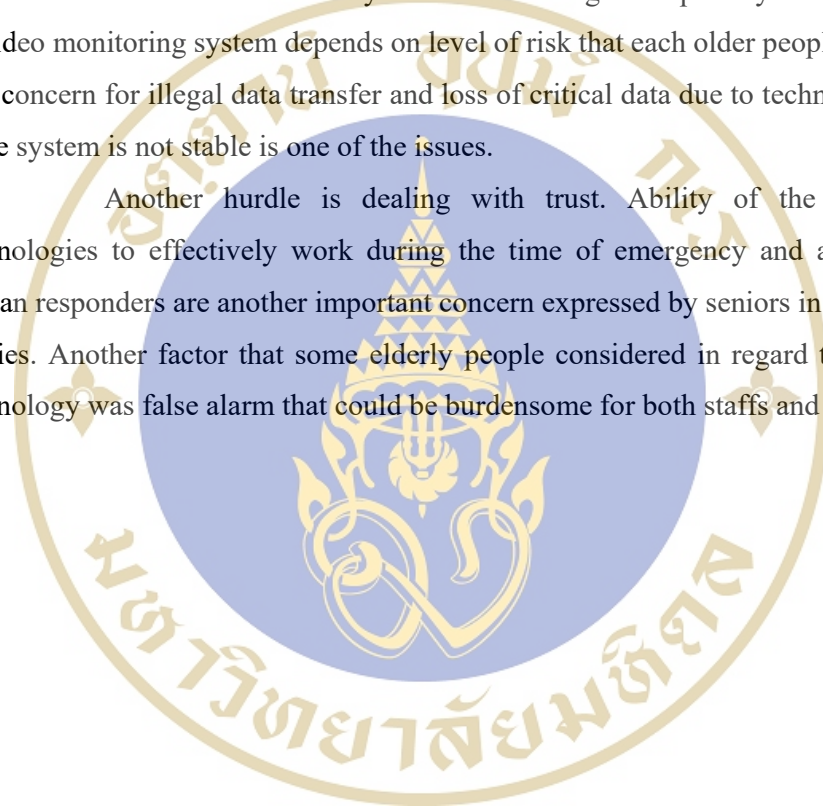
2.4 Concern of aging in place technology

When designing the smart system, a need to understand older adult users' perception of a system in their home or healthcare settings is crucial. Acceptance of such robotics and remote presence systems which are being designed for older adult use, is still opened. The common assumptions are that older adults do not accept new technology, less experience with technology and computer anxiety (Czaja et. al, 2006).

With robotics in particular, it might be assumed that older adults may not be as accepting as their younger adult counterparts because they are concerned about the difficulty and how user-friendly of the system is if they are going to learn (Demiris et. al, 2004).

In adoption of smart home technology, privacy is the huge concern when installing video monitoring devices in a private space. Majority of the seniors were positive for video monitoring system if the captured image shows only shadows in the cameras which make seniors anonymous. Elder's degree of privacy violation concern of video monitoring system depends on level of risk that each older people had for fall. The concern for illegal data transfer and loss of critical data due to technical problems if the system is not stable is one of the issues.

Another hurdle is dealing with trust. Ability of the smart home technologies to effectively work during the time of emergency and availability of human responders are another important concern expressed by seniors in almost all the studies. Another factor that some elderly people considered in regard to trust of the technology was false alarm that could be burdensome for both staffs and the elderly.



CHAPTER III

METHODOLOGY

3.1 Qualitative in-depth interviews

Series of focus group sessions was conducted to assess Thai consumers' perceptions and expectations of the health monitoring technology as well as the ways they believed technology can improve their daily lives. The sessions were facilitated by researcher (myself) and followed facilitation guidelines for interviewees by conducting interview sessions with 37 participants with 25 seniors and 12 adult children living in Bangkok by in-depth interview method. Interview sessions were classified by sex, marital status to create a homogeneous group environment to encourage open discussions.

The in-depth interview are structured in a way that participants responds to the questions in an open forum style. In general participants actively interact with the researcher to generate data and share openly. Interviewees were prescreened over the telephone to assess eligibility for the study. Upon successfully completing the prescreening process, they were scheduled for an interview session. The questionnaires were sent to each interviewees to be completed at home and returned to the researcher at the time of the interview. Upon arrival to the study site, interviewees provided written consent. Both female and males interviews were moderated by the same female researcher. Interviewees were informed that the discussion would be digitally audio-recorded and later transcribed. The moderator then briefly described the topic and goals of the interview session as well as the rules for the conversation. Interviewees were asked to speak about their own personal experiences. Discussion was initiated with an "icebreaker" in which interviewees gave their first names and to briefly describe their home and how long they had lived in that home. Interviewees were then asked to describe the tasks they must do to maintain their home and to discuss the tasks that were difficult or could become difficult to perform. The available products, services, technologies, and remodeling options that could help with those issues were also

discussed. Interviewees are given an opportunity to offer additional comments about price range of the budget to install to renovate old houses to be the smart homes.

3.2 Participants

The research conducted on 25 independently living adults between the ages of 60 and 85 years old, fourteen women and eleven men, who targeted as the primary users of the aging in home health monitoring technologies. Eligible seniors were required to live independently. They either lived alone or with their spouse only (i.e., no children). Some of the interviewees got married, some were holding the single marital status. Another group of interviewee was family members of seniors over 60 years old who lived separately with the children who were considered as the physical and financial supporters of technology users. This group of adults consisted of five male and seven female who aged between 25 to 36 years old and financial dependent from the senior parents.

3.3 Questionnaire design

The information needed for this research is the awareness, perceptions which are adoption willingness, usefulness, and the concerns of using health monitoring technologies for elderly people to be independent at own home. The participants first needed to be aware of the definition of “aging in home” followed by information of the health monitoring technologies which currently exists in the U.S. market and has a market potential to be adopted in Thailand based on the government policy supporting the development of digital economy. A detailed description of each technology and retail price in US Dollars were presented alongside the questions. To help non-technical participants to understand each technology better, sample photos of the selected technology were provided.

The questionnaire consisted of two sets to get the information both from the seniors and family. Elderly people were considered as direct users of health monitoring technology and facing the aging in place. While family was another key

group of people who needed to be ready for the demands and responsibilities of becoming their parent's caregiver, physically, mentally and financially. The sampling gave family a chance to say what they need and plan for caring their own aging parents. Each set of questionnaire was divided into three sections. Section one was to ask about the sense of aging in place starting with the current living environment and daily activities, the awareness of the term "aging in home", and the necessary components in the participants' perspectives in order to happily age in home. The elderly participants then were requested to openly list the issues that make living at home difficult and the desires to live independently. While in the set of family, this part included the current spending and their willingness to spend for their aged parents, and the self-preparation to be parent's caregivers.

In section two, the perception and concerns of the use of health monitoring technologies were discussed. The three selected technologies from the US market were used as samples. The selected technologies in this research are first "wearable device", for example, the smart watch itself has the ability to monitor health conditions and send out the predefined text message on SOS whereby the family, friends or the care giver get that alert. Second is Mobile Telepresence Robot where they provide a real time teleconference connecting seniors 24/7 with the loved ones. The third is Smart home allowing the senior to be able to control their home environment, light, locks, temperature, and surveillance system, including the sensor in bed or bathroom where the senior's health conditions and daily behaviors are monitored and analyzed as routine pattern.



Figure 3.1 Wearable Device and Mobile Telepresence Robot



Figure 3.2 Smart Home Technology

The questions were open for senior participants to input any factors that may cause concern on certain technology and extent of concern of several factors such as privacy, lack of human responder or loneliness, user-friendliness of the system, training needs, usefulness and effectiveness of the technology in their points of views and the cost of technology. For the family, the sampling were family's concern when seniors use the technologies and their abilities to assist their independent living aging parents who were the technological users.

Section 3 collects participant's information such as gender, age, income, current living arrangement, etc. Sampling was used to include participants with different occupations, living arrangements, and levels of technology experience.

CHAPTER IV

DATA ANALYSIS

These statistics from the World Health Organization give the overview of what to predict in terms of aging society in Thailand. Research allows to focus on older adults and their family about their awareness, needs, and perceptions on aging in home including the available preventive health monitoring technologies.

4.1 Participant demographic

From total of 37 participants, twenty five of elderly persons who age 60-85 years old are interviewed together with twelve of the family members (five male and seven female) who both have living with and separately from their parents. All participant are residents of Bangkok.

Twenty five senior participants comprised the first focus group, conducted at Bangkok. The first group included eleven males and fourteen female seniors who are potential users of the aging in home health monitoring technologies. All currently retire from various occupations where several identifying themselves as government and state enterprise officers, high school teachers and university professors, and entrepreneurs. Majority of participants live in their existing residences which are standalone houses. Twenty four percent dwell in housing estates, thirty two percent stay in townhouses bought by their children, and four percent live in condominiums. The elders can be divided into three group, first is elders who still lived with their married kids (36%). Second group is the elders who live alone with elderly spouses (52%). Third group is the elders who live alone in the same house for over 10 years (12%).

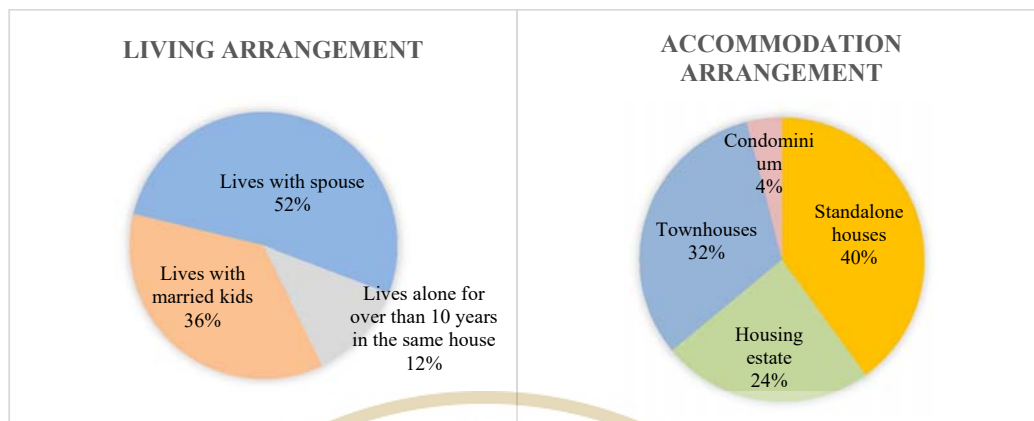


Figure 4.1 Thai Seniors Living and Accommodation Arrangement

Twelve family members involve in this study as second group of interviewees. Five participants are male and seven are female. The age ranges from 25 to 36 years old. They are counted in different categories of occupations. Some are working as retail salespeople, private company employees, prosecutors, government officers, and airlines staff including cabin crews with the estimated monthly income of 30,000 to 120,000 Baht. Another group is the self-employed running their own coffee shops, restaurants, and car dealers earning average of 100,000 to 250,000 Baht per month. Research has shown most adult children preferred to live in condominiums. Total of thirty four percent live in townhouses and housing estates. Twenty five percent dwell in standalone houses inherited from their parents. Sixty percent of adult children live alone or with spouses in their own new accommodation separated from parents. Thirty four percent stay with parents in old houses either single or moving the spouses in.

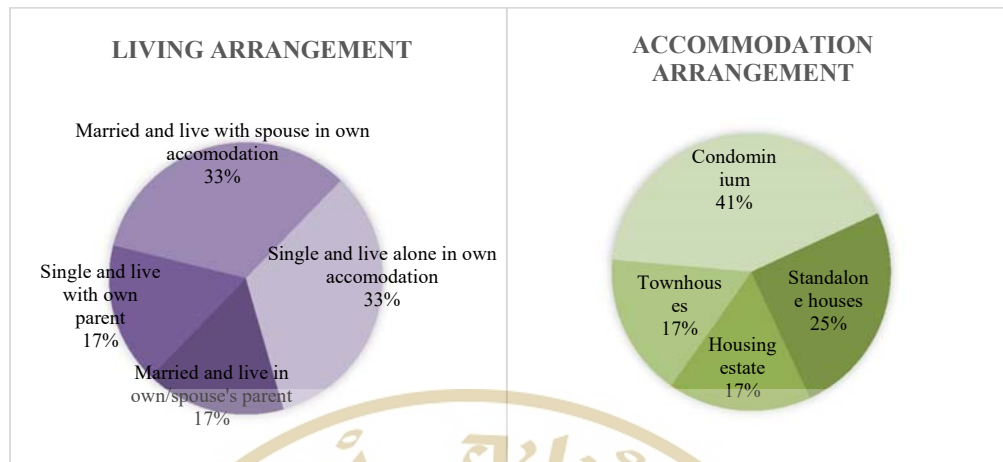


Figure 4.2 Thai Adult Children Living and Accommodation Arrangement

4.2 Awareness of aging in place

For the elder group of participants, “aging in place” are not familiar term. Participants thought it means getting old with physical disabilities and die alone in the same place. Half of seniors looked at it as normal behaviors for elders. Their kids left home after grown up with financial ability to take care of themselves. The parents are left behind and usually continue living in the same house their built. Three of them know the key word from aging society research and academic study. Last three persons have the idea of aging in senior cares.

For the family, aging in place is not a popular term in current aging policy in Thailand. Practically more and more kids move out from the guardians as soon as they are financially dependent. The family conjointly mention about the typical elders’ mindset not to leave the places or villages where is full of the relatives and childhood friends. The communities where the tenants continue living generations by generations. Aging in place thus perceived as a normal way of getting old as same as seniors mentioned above. Two of family members think of it as living with the help of hi-technologies. Four participants imagine themselves getting old with hundred percent financial readiness to be able to live alone without any supports from their kids in the future. At the end of questioning, the understanding of the term aging in place is

developed to be in the same way as staying healthy and independently in own home or own community.

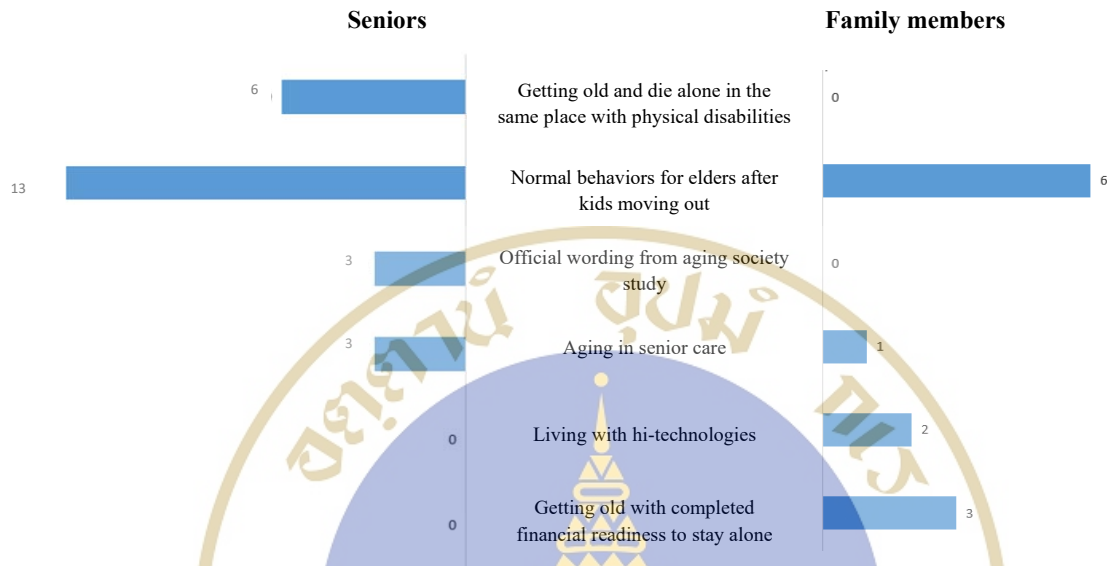


Figure 4.3 Awareness of Aging in Home of Thai Consumers

4.3 Sense of aging in place

In the second section of the questionnaire, as a preparation for aging in home, older adults' and families' individual perspectives on what constitutes successful aging in home are asked.

The result of first part shows six components where seniors and family think that necessary to happily age in home. The seniors rank "Safety in own shelter" and "Stay healthy" as top two priorities followed by "Financial status".

Safety in own home which can interpret as a "Trust" comes from the below answers:

Mr. Jang, 74:

"I worry that I am going to die alone in my own house"

Ms. Suchitra, 62:

“I like to live in the place which I familiar surrounding by friends, I can walk to their house every day to get the meal when I don’t want to cook myself and sometime give the meal for them”

Again the trust issue plays into part once there were some reluctant of hiring the maids whom were completely strangers to the seniors.

Mr. Kanapong, 65:

“I need maid or my grandchild helping me for cooking, laundry, cleaning but I worry she is going to cheat me later and steal my money and properties”

Changing healthcare needs are avoided to ensure the seniors health conditions

Mrs. Jintana, 71:

“I want to see the same doctor when I am sick because he knows me well”

Participants liked to have their own space and be independent. They preferred to have their own televisions and computers where they were free to move and see the favorite programs whenever they want. This is equivalent to what the family comments about some differences in elders’ daily lifestyle which was one of the reasons the family decided to live separately. They need to be financially prepared for the being alone so that financial concerns come in the third. As they grow older, they need somebody to help on daily work for living life such as laundry, house cleaning, cooking, fix the house, TV, light bulb and etc. Few female elders raise financial concern of the cost of acquiring housemaids, which prices around 5,000-8000 bath per month, since their monthly pension after retirement may not enough to cover the additional costs. Some of seniors live their life’s using monthly funding from their kids.

However, the seniors who live with spouses and alone in the same house for a long time facing the same issues of loneliness, and daily activities. Loss of mobility to connect to society, and home maintenance are significant hurdles to this simple and primary desire.

Mrs. Buasri, 69:

“It is hard for me to fix the things in my house when something are broken”

Mr. Kornsak, 63:

“I don’t know how I can afford to keep my house to be the same in next 10 years”

The ability to travel by their own is another issues, seniors were not confident with their own health and ability to move themselves physically or by using cars or public transport alone without accompany. To be able to move and travel by themselves was the most desirable things they were looking for.

Mrs. Sanit, 71:

“I am sick of long way traveling just to spend 10 min seeing doctor and get medicine”

Ms. Lamduan, 64:

“I love shopping and I always do, however few years recently I feel not to enjoy walking and shopping as long as I used to. I feel pain and hard to breath, and I need to rest longer at home after I come back from shopping”

Ms. Apa, 65:

“Now I can drive myself to go everywhere, I wish I can drive till I am 80”

Ms. Inthira, 61:

“My kids always work late and have activities with their friends and boyfriends, I wish I can go somewhere by myself, otherwise I need to wait for them to give me a ride”

Surprisingly the family prioritizes “Financial stability” to be the first, then “Healthiness” and “Safety in own shelter”. The loneliness and connecting to the society are the fourth in ranking. The modern life making both seniors and family lonelier from being apart. None of the adult children talk about the house maintenance at all where it comes as a lowest ranking for seniors to be concerned. Lack of close family ties reduce connections with their family, which results in an inability to actively participate in the community activities. With aging, it is inevitable that parent lose connection with their friendship networks and that they find it more difficult to initiate new friendships and to belong to new networks.

Ms. Kulthida, 33:

“I am a flight attendant, I always fly long haul flight and spend most of my time apart from my parent living outside Bangkok. They must be very lonely and I cannot help them if some emergency happens”

Mr. Krittin, 35:

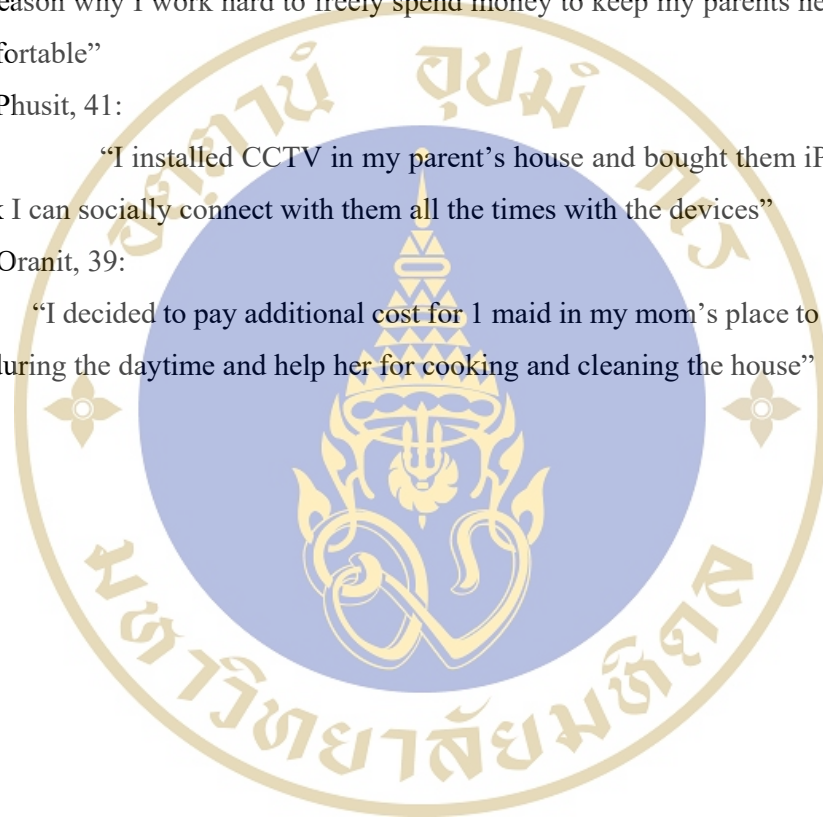
“My wife and I live in the same house with my parent but we only see them few hours during the weekend because of my routine jobs and my own business that is the reason why I work hard to freely spend money to keep my parents healthy and feel comfortable”

Mr. Phusit, 41:

“I installed CCTV in my parent’s house and bought them iPads because I think I can socially connect with them all the times with the devices”

Ms. Oranit, 39:

“I decided to pay additional cost for 1 maid in my mom’s place to taking care of her during the daytime and help her for cooking and cleaning the house”



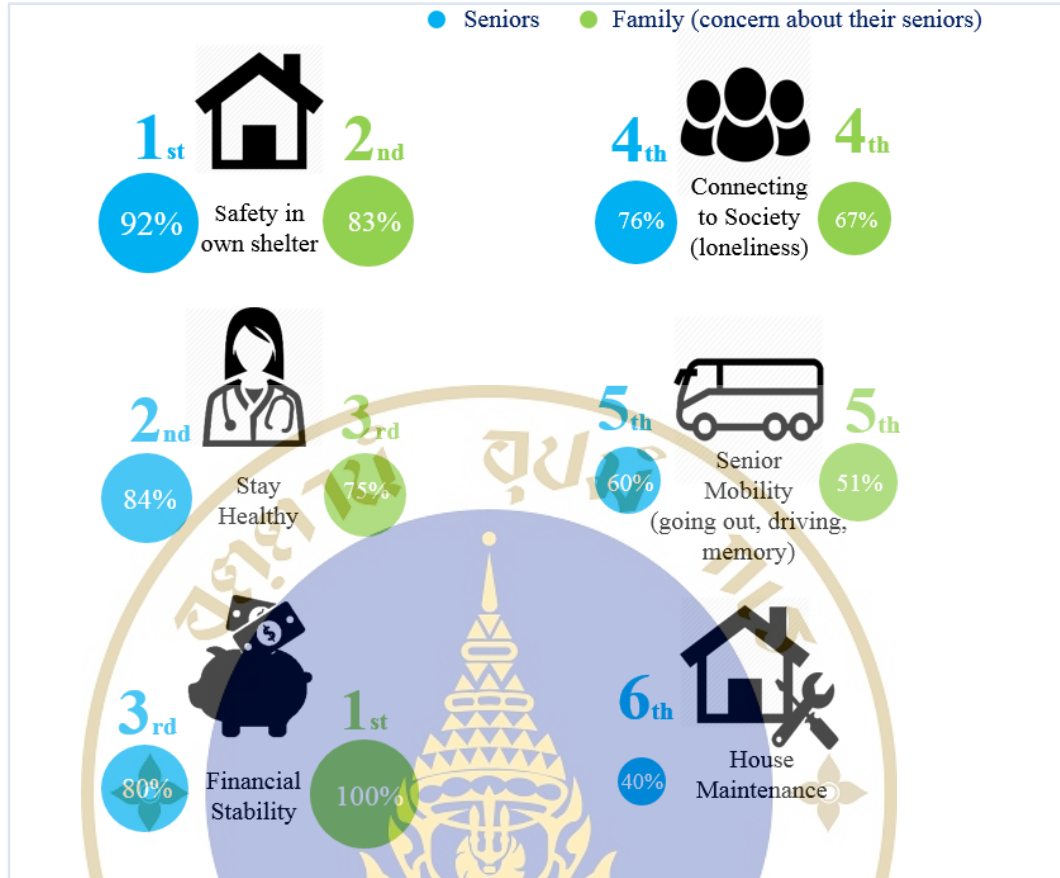


Figure 4.4 Key Component of Aging in Home of Thai Consumer

4.4 Sense of dealing with technology to monitor health conditions

4.4.1 Preferable price of three selected health monitoring technologies

After introducing the aging in place concept and accessing the needs and desires of Thai consumers in order to effectively age in home, the third part of interview is to use three selected available health monitoring technologies to ask about the willingness of adoption if they were happened to launch in Thai market. The target price which both seniors and adult children are willing to pay is 2,969 Baht for wearable device with basic functions of monitoring vital signs and symptoms and sending alerts via short-messaging. Average of 17,890 Baht is preferable for mobile telepresence robot used in the context of promoting social interaction between seniors and family. It can

benefit to the telemedicine which allows the doctor to provide clinical health care from a distance. The range of investment on a smart sensing system or smart home is determined. The fact that it is related to the house usable space and investor requirements, participants are asked to calculate based on the comfortable variant functions of lighting, heating, window blinds/air conditioning, and sensing to detect fall and vital signs over area of 200 square meter. The preferable price are in total 68,900 Baht.

4.4.2 Willingness to use health monitoring

23 out of 25 elderly participants have minor health problems. In the part of perceptions to the health monitoring system, cost of technologies is the most concern for both groups. The seniors also raised concerns about the video camera and health data collection as an intrusion of privacy. While technology may lead to the lack of human response which is fear of loneliness. At the same time the family concern about how easy their parents are able to use the technology where the new technology learning is extremely necessary.

Wearable health technology is drawing serious attention from the participants both older adults and adult children since it is recognized as excellent commodity offers an efficient and cost-effective solution compared to the other two. They are familiar with using LINE, Facebook and internet since it is the communication channels they used with their relatives and kids. However, they have no experiences of the wearable device before and are likely to be annoyed by wearing additional devices (watch, token, or necklace) since it adds more effort to keep and carry with them all the times. This shows the concerns of level of comfort and body conformability, short battery life, and the high frequency with will need health-related assessments.

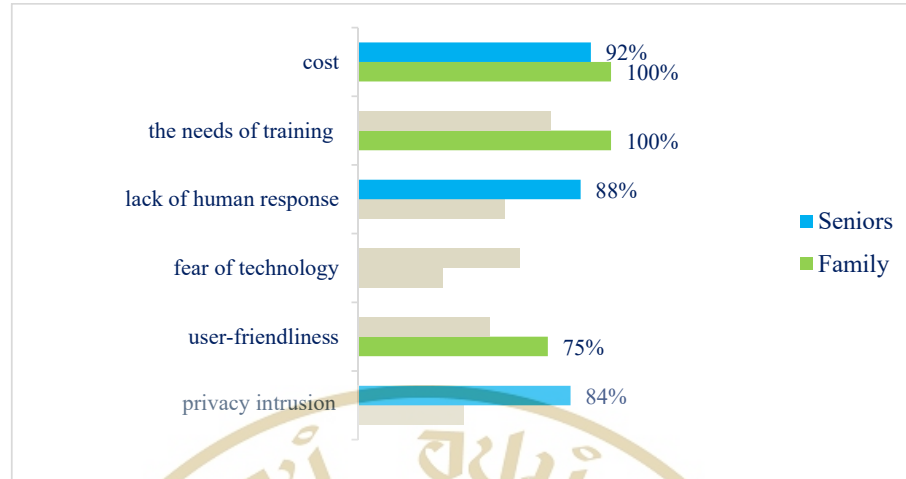


Figure 4.5 Concerns of the Use of Technology

Mrs. Pimpun, 64:

“I have diabetes, I know the Apple watch has glucose monitoring (CGM) app but I don’t know if I should buy it”

Mrs. Buasri, 69:

“I feel annoying when I set alarm for reminding me taking a pill, because I need to keep iPhone close”

Mrs. Wanna, 64:

“I am not sure the frequency from the GPS tracking device will be harmful?”

Robots in house impress everybody to be the intelligent ideas. However they underestimate that it would be impossible to implement in Thailand in the near future. Their concerns are about safety of the robot and the complication of this technology to use including maintenance. They perceive as intrusion of privacy when robots equipped with video camera move around the house, limited connectivity when using teleconference, concern on data security, and high production costs.

Ms. Jidapa, 75:

“I don’t think Thailand is capable to use robot to be that close to the human, It seems not safe and incredible something unaffordable”

Mr. Krittin, 35:

“Robot may be expensive solutions than hiring the maids which are real human”

For the smart home sensing technology, it is considered as the option for them to implement and make them live their daily life with one touch. However their concern are similar to the robot in terms of the maintenance of smart home technology including the backup system when the smart system fail and how the system stores the personal data security and processing. Some female seniors are doubt about the activities which cannot apply smart solutions such as cooking meal which consider as compulsory to stay alive. The loneliness from living alone in the high technology environment and costs of implementation smart solutions in house still be the major concerns.

Mr. Nikom, 73:

“If my kids know I can live alone, they will be only use Facetime to me”



CHAPTER V

DISCUSSION AND RECOMMENDATION

This study explores Thai consumer's concern of being in home with the help of smart monitoring technologies. From investigation of how elder people and family understand the meaning of "aging in place," a term widely used in aging policy and academic research but undetermined with elderly and family themselves. The seniors like to stay in their own home and communities whereas the adult children are likely to move accommodation closer to jobs and their kids' schools. It is scenario for millions of adults when parents are getting older and no longer complete their day-to-day activities without some assistance and caregiving. The children often need to take responsibility and role reversal with the critical decision of whether or not to provide home medical task themselves or use the nursing services and caregivers. On the other hand the seniors themselves are annoyed of overprotective but happy to be cared by their children.

Adult children express the willingness to spend maximum 15% of their salary to ensure the well-being of their parents and such monitoring technologies are the key. The majority of the seniors and adult children in this study (30 out of 37) have a positive perception of aging in place with smart solutions. The seniors and family further appreciate that smart care and monitoring technologies can acquire digital information and influence their aging behavior.

5.1 Key components of aging in home

Seniors want to make their choices of where and how they age in place. The key to a successful aging process is having a plan and dealing with things appropriately so that less effect on the quality of life. Understanding the basic of what

senior want can be used as a guideline for creating the plan to ensure that parent's desires are honored.

The data are collected from both seniors and the family members who will involve in seniors decision making to be aged in place. Participants' feelings towards being aging in place with the health monitoring technology can be interpreted as the "desire to" and "fear of" which are two sides of the same coin. However, the fears concentrate on are the ones human deal with every day. They are the concerns of every seniors. The topics include:

- Where to live?
- When or if to move?
- When to stop driving?
- When to stop paying your own bills?
- When to have help in the home?
- How much money is there to pay for it all?

On the family's perspectives, the desires are more on the best wishes to the senior being independent as much as the seniors can. This will reduce the needs of family and care givers to be physically present at seniors' place all the times and less cost for the seniors medical treatment which usually paid by the kids, relatives and family. According to the research, six key components for aging in home are mentioned by the participants.

5.1.1 Safety in own home and communities

Almost all seniors want to live their lives in the home they have known and loved. Seniors want to maintain their autonomy as long as possible. The longer they live alone, the greater risk for in-home injuries as they become more likely to falls or other accidents which can result in serious injuries. From the interviews, fears are shown in many ways. Starting from the one of their greatest fears of nobody knows when they fall, losing the ability to be themselves and their independence. They want to avoid being a burden on their families, be in control of their lives, and make their own decisions. Most do not fear death as much as they fear becoming dependent on others. They all resist change but want continuity. Helping seniors to remain physically safe in their own homes is essential to overcome the fear mentioned above. They fear of being

alone and unable to solve unexpected problems, the wish is to immediately contact someone whenever they face daily problems. They fear of accuracy of technology and trust in technology compare to medical doctor. They are likely to be loved and taken care by the love ones or trustworthy persons (including maids and doctors). They express the fear of unstable finances so that cannot afford high technology. It is elevated to be another psychological level like fear of being invisible among family and societies, not earning the respect from younger generations, fears of changing of social norms where seniors are able to take care of themselves and need no supports from kids. They prefer to get in touch with kids and love ones whenever they need them to feel safe. Elderly want to be treated with dignity and as adults regardless of how much help they need from others. Both physically and psychological safety are revealed from the seniors as the number one concern.

The same fears occurs to the family compared to the seniors', which are fear of senior fall in the houses, fear of security from thieves, criminals including the threats from hiring new house maids. It shows the fear of having accident regarding the IADLs (fire/injuries from cooking, shopping outside, driving or taking taxi, and etc.), and possibility of being lost when go outside. The children want to ensure seniors' safe lives wherever they are at home or outside, to make sure seniors get what they want, to live their lives happily similar to when they were young.

5.1.2 Healthiness

Families no longer grow up in towns and remain there till they die. Statistics show that people change jobs every 2.5 years and homes every 5 years. As a result, adult children may move themselves across the country from their parents when parents begin experiencing their aging challenges. Older adults concern about mind and body and agree to maintain good physical and mental health in order to live alone by eating healthy, keeping a positive attitude and getting good sleep. The healthy behaviors will keep health care costs down as they age.

The fact that adult children are either working full time and traveling, leaving them too busy to assist their parents, rarely talk to about aging and are caught by surprise when something happens. The children have very little knowledge of senior issues to depend on their parents to reveal the truth about their health and living

situation. This gives them a hard time admitting that mom and dad's lives are declining. Adult children express the desires to ensure their parents to be active as long as possible. Being healthy and independent are the key. This include the desired for making sure parents are healthy, able to operate daily activities, and on time for taking pills or regular medical checkup with the doctors' appointment.

5.1.3 Financial stability

An important start to an aging in place plan in adult children's perspective is to make sure the long term financial ability. The lack of planning in these areas can be devastating to well-being and family's peace of mind. While seniors see it as the third priority after safety and health conditions. For seniors, planning for life after retirement raises emotional issues. Staying fit and healthy lower the living expenses. People tend to underestimate medical costs in retirement.

Some of the issues are obvious, such as higher medical costs and the lack of funds for Medicare and social security. In fact the adult children have no idea how much their parents have in savings to pay for their care if they should need it. No matter how much the older adults are excited to use high technology for the purposes of knowing in advance, regular monitoring health or keeping up with kids as to fit in and be part of society. It is important for Thai consumer to have an idea of a realistic cost of aging in place to budget the dream into financial plan. Issues to consider include the cost of daily activities, healthcare, housing expense, proximity to family, transportation, and leisure activities. An important plan is making sure a monthly cash flow exceed the expenses.

5.1.4 Connecting to society (Loneliness)

Seniors prefer to remain in their communities. Rather than move to a new community. Even one that might be more physically suited to their needs, the vast majority of older adults prefer to stay right where they are. They have a strong need to feel connected and be important part of the family and society. Nonetheless, friends and the familiarity with a place no matter home or communities is important issue for aging in the good conditions. Both are used by seniors as a safety guarantee that someone will look for them if something is wrong and know exactly where should be the specific

resources for them such as particularly hospital or restaurants. Most important is the fear of senior being depress from staying alone since family and kids spend less and lesser time with the seniors and spend more at workplace and their own family.

5.1.5 Senior mobility

Aging in place help seniors live their lives in joy not only staying in their own all the times. Unlike the grandparents of the past who are living with their sons or daughters, sitting on the porch in a rocker watching the grandchildren play on the lawn, today grandmother and grandfather are still traveling around the world, going out on Saturdays, dancing at the senior center on Thursday night, and volunteering at the local food kitchen. These grandparents are not babysitting their grandchildren or sitting around watching TV. These seniors are the “young old.” Still vital, strong, making their own decisions and still in control of their lives. Many continue to work well into their 70s. They want to remain independent for taking any transportation which they used to. Seniors like to have sense of independency to be able to have own space, move and travel independently. Some of them are reluctant to stop driving. Older adults who are no longer able to drive attend lesser medical appointments, and out for meals less often, and reduce the frequency of visits to friends and family including go shopping compared to other senior drivers.

5.1.6 House maintenance

The older adults are experiencing difficulties in maintaining their homes. House maintenance includes indoor tasks such as general cleaning, vacuuming, changing bed linens, doing laundry, cleaning the toilet, dishes washing, taking out the garbage, and replacing light bulbs. Outdoor tasks included lawn mowing, or painting the exterior of the home, pest control, and roof replacement. Aging declines the capabilities of older adults to maintain their homes. Meaning to say, asking for help from neighbors or wait for children to repair items. That is to consider paying someone or use the maintenance services which seniors need to keep extra budget especially for home repairs. Surprisingly none of the family member discuss about this issue in the interview. In this part the children want to make sure only qualified people do work

when hiring someone to perform work for seniors, and the loved ones are safe from the strangers which have mentioned in the part of safety in own home.

5.2 Concerns of the use of technology

5.2.1 Cost of technologies

Older adults express various concerns when they consider technology for aging in place which they have not been used. Cost of technologies is the most significant concern to participants. Price factor affect the acceptance of technology by both elderly and children. From Thai consumer experiences, unlike in many other areas, the cost of health care technology is not declining over the time. From the samples of three selected technologies where the retail price in USD are revealed, costs regards to assisted living are considered unaffordable for some people. Additionally there are sometimes hidden costs to aging in place which are not able to foresee since none of the technologies currently exists in the country. The cost-effectiveness studies of the health monitoring technology will contribute to consistent development of new technology and the costs can change.

5.2.2 Lack of human response (Loneliness)

With all the technology provided for senior and health care, it helps the participants to live alone without any interaction with the world outside houses or their communities. The next biggest question from seniors after cost of technologies is concern of loneliness which isolates older people. Technology can bring seniors closer to people they are far away from, but farther from the people they are close enough to. Advance and sophisticated technology may take seniors away from the social interaction and relation with their friends and families. Even though assessing loneliness in older adults is challenging due to the negative desirability biases associated with being lonely. This is the area where there is a room for improvement. The seniors should age in place safely, independently with the good mentality. How to let the seniors be independent while still keep with the world rapid changing environment and no feeling of leftover or depress. Seniors wish the technologies to be designed to promote activity, be companions, and tackle loneliness of older adults and people with disabilities in order

to deal with loneliness and depression by connecting them with other elderly or the loved ones.

5.2.3 Training need

In order to implement some technology in the senior's life, the awareness about the benefit of the technology and the training of how to use and fix technology by themselves are the key point to make them comfortable to use technology because it will be with them every day 24/7.

A significant majority of older adults say they need assistance when it comes to using new digital devices. Just 18% would feel comfortable learning to use a new technology device such as a smartphone or tablet on their own, while 77% indicate they will need someone to help walk them through the process. And among seniors who go online but do not currently use social networking sites such as Facebook or Twitter, 56% would need assistance if they wanted to use these sites to connect with friends or family members.

5.2.4 Privacy intrusion

Privacy implications are another concern mentioned by the seniors. Privacy concerns cause many seniors to fear and avoid online transaction. Adopting assistive technologies or the in-home video camera make loss of senior privacy where the data and image flow are transparent. Security is a primary concern in healthcare applications since they often deal with confidential and sensitive senior's health data, who is collecting and analyzing the information, and where it will be stored. In addition, it may require maintenance and costly upgrades. However their privacy valuation can be partially tradeoff to the usefulness of the technology and the sensitivity of the activity which the being collected.

5.2.5 User-friendliness

The result shows that the participants are quite concerned with the user-friendliness of the device apart from the need of new technology training. When looking into IT experiences of the participants, the result surprisingly revealed that most of the participants with computer experiences mention this issue as a concern. Unlike their

adult children, the elderly have not raised in an age of technology. Technologies for the family members need to be accessible and user friendly their parents and to fit the behavioral side of maintaining independence.

5.2.6 Fear of technology

Older adults mention the fear that technology in the way that they have no confident to take control over the activation the technology. Regarding the consequences of using technology, the possible negative effects on their personal health, for example the frequency of the radio waves, are mentioned together with the effectiveness of such technologies. The appearance of technology makes others perceive the users as unhealthy or disability.

5.3 Recommendations

Based on the interview results, the implementation of aging in home solutions should start from the level of communities and township. More and more people will live in the same houses. There will be the opportunity of new community and shopping malls emerge to serve the needs of senior at home. The entertainment activities and packages both online and offline will be customized as a compulsory for seniors to continue living independently while keeping social interaction. The communities which adopt “Smart home technology for senior citizen” emerge new community services and mark a multiplier effect in stimulating local economy. Smart home system with the excellent customer services can be implemented to overcome fear of being alone and help seniors to be physically independent.

Moving forward to the corporate level, the companies/or entrepreneurs who are thinking of launching the Smart home solutions for medical care to the market should consider to provide the user-friendly products to ease the difficulties of growing old alone while earning trust by ensuring the users data security. As mobility reduces with age, having goods and services delivered to the seniors’ door makes a great deal of sense. The opportunity of e-commerce which the online sellers cannot afford to ignore older shoppers on website. There are, however, specific challenges associated with elderly people using the technology especially the online services and e-commerce

which they may, for example, be more interested in increasing the font size on website and etc. just to have a kinds of factors when designing website.

For the macroeconomics level, smart solutions for aging in home can be an option for Government to implement the long term plan for Thailand aging society and health care policy including tax restructure. Having good health by using technology to monitor disease to symptom increasingly means managing seniors' long-term care rather than spend huge budget in the medical treatment. Likewise, the concept can be applied to the children for home school and patients for telemedicine.

5.4 Strengths and limitations

This study's strengths are in extensive search strategy, covering databases in the fields of psychological study, health care technology, and engineering. Another strength is also reflected in the extraction of insight information from qualitative research where not only the seniors who are technology users being interviewed but also the inclusion of the perspectives from family. Looking at the contribution of the literature review to this research data. The systematic approach can be found in the sampling using three selected technologies. The available evidences lead to the in-depth discussion and concrete ideas for participants of what they are going to deal with when aged in home. This research findings are supportive to the articles about the privacy concern of the seniors. The additional findings from the interview can enhance the knowledge of Thai consumer regarding aging in home.

Nonetheless, this review provides information of only Thai consumer who are current residents in Bangkok. Furthermore, the investigation focus solely on the concerns and acceptance of consumers, not the willingness to purchase since some technologies are at the initial stage of implementation in country. The questionnaire is designed to imply family's feeling to support their parents to be aged in home. The perceptions of adult children of future planning for their own aging in place are not covered in the study.

CHAPTER VI

SUMMARY

Thai seniors and adult children are more independent. However they want to be in-touch and get connected whenever they want as influenced by collectivism. Both older adults' and family's perceptions and use of technology are rooted in their personal, social, and physical background and environment.

Maslow's hierarchy model which explains levels of human needs not only apply to a variety of economic and social situations but also to the needs of the elderly. Knowing the seniors hierarchy needs is helpful for family and caregivers to assist their elders to age in home for longevity with a high quality of life by achieving the highest level of satisfaction, self-esteem and self-actualization. It perfectly shows five areas that contribute to quality of life for the aging rather than the common health care focus of longevity of life.

The development of advanced smart health care technologies that enable baby boomers to age in place is as important as analyzing the needs and motivations of seniors. Failure in attention to user needs results in the limitation of aging technologies adoption. Maslow theory explains the outcome of this research in the way that as people grow older, they proceed up the staircase of the needs where life physically decline. The need on the first step is basic to stay alive such as food, water, and sleep. The next step represents safety and security that is to say the need for shelter (living in own home), employment (financial stability), health (ensure safety and healthy), and the family. The need for step three is belonging and love which comes from family, friendship, and intimacy (being connected socially). The fourth step is for self-esteem, confidence, achievement, respect of others, respect by others (feel recognized from the children and able to get in touch with love ones whenever they need them). The last step which is not mentioned by the senior in this study is for morality, creativity, problem solving and is referred to as self-actualization. Each step of the needs use the different level of health monitoring technology integration.

Awareness of aging in home is crucial to facilitate the right demand through the use of technology. The goal of technological intervention for aging in place is to empower older citizens to live and socially engage with a maximum degree of autonomy, safety, security, and dignity. Technology potentially can facilitate this objective by furnishing the means and infrastructure to monitor the older citizen's medical status and welfare, while appropriately and flexibly responding to situations requiring human assistance and support. Technology also can assist in activities of daily living through automation of household functions and accessibility of the living environment for improved mobility throughout the home. To establish the role of technology for aging in place within proper context, it is necessary to consider the foundational objectives and prerequisites from any particular technological approach implementation for a secure and safe environment designed for older people living independently in the community.

Acceptance of technology is influenced by multiple factors. Cost is the major concern of Thai consumer. In order to adopt a successful aging in place concept, older adults have the right to decide what they allow into their own homes where the factors of privacy intrusion and loneliness are main concerns. Supporting older adults to remain in their own homes and communities is the family task to choose the most user-friendly technology to ease their parent life while technology training service is compulsory to help the parents live independently for as long as they possibly can.

Much of the care that are provided are only be done by humans but at the same times technology can be helpful in terms of monitoring, connecting patients with doctor, connecting older adults with the love ones to ensure that they are well taking care of, and stay actively and independently at home. Connectivity need the connectedness which ultimately is the greater engagement with health and feeling of security, belonging which are ultimately the better outcome.

6.1 Usefulness of the research

By understanding how older adults are maintaining their homes, designers of person-related and environment-related solutions can enable aging in place.

Architects, designers, and home service providers can use this information as a starting point for identifying difficult tasks for intervention. Technology providers should consider to upgrade solutions for some of these challenges mentioned in using the samples of health monitoring technologies to serve the user needs as the next step of the development of technology to support aging in place

The research can be used for the marketers to expand the scope to cost-effectiveness studies of the technologies. It will be an important source of information for public and private providers and more studies could help to stimulate in the market. Long term care insurance policies can be customized in meeting the preferable cost of technologies. This information is favored by policymakers and health providers to seek to influence the economy in order to develop elder care services nationally and avoid the costly option of institutional care.

6.2 Suggestions for future research

Health monitoring technologies for aging in place seems to be favor in elderly care. On the other hand, people may feel uncertainty in the adoption of these new technologies. First, technology has the potential as a powerful solution for successful independent living. Second, the ethical implications and protocols are not yet adequately clarified; in particular, there is risk of overreliance on technology to supplant appropriate human intervention, thereby exasperating a condition of social isolation by the technology beneficiary. Third, looking to the future, technological advances are proceeding at an exponential rate, with new disruptive technologies being introduced in rapid succession. Consequently, it is increasingly difficult to establish firm baselines upon which to benchmark the social and functional value of new aging in place support technology-based systems and services. Nevertheless, few probably would disagree that the role of technology for successful aging in place is paramount and merits high priority on the research agenda.

The future research can be more on the study of how health monitoring system could provide safer and capable to reduce the medical cost in the long run. To get a clear and comprehensive understanding of aging consumer trends, the dominant

incentive to adopt such smart health care technologies and how that technology adoption change Thai consumer behavior as a database to manage behavioral change. Such studies can contribute to the development of sustainable business models for technology and services providers and, most importantly, to the higher quality of life for older adults. The future research can be further on the study of how health monitoring system could provide safer and capable to reduce the medical cost in the long run.



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APPENDIX A

Interview Questions

Seniors Questionnaires

Part1 Sense of Aging in Place

1. Which kind of house are you living in? With whom?
2. What are your daily activities?
3. Have you ever heard word “Aging in Place” and what does it mean to you?
4. Would you prefer to stay in the same house alone or move to new house in order to live together with one of your Children? (e.g. when they get married or living in other provinces or countries) Why?
5. If you want to stay alone in same house rather than living with Children in the new place, what is your concern, or hurdles that you are currently afraid of?
6. If you want to stay with children in the new place rather than stay alone in same house, what is your concern, or hurdles that you are currently afraid of?
7. If you have to stay alone in the same house, what should you prepare or need to have in order to stay happily?
8. Have you ever felt lonely, and how did you cope with that feeling?
9. What is your plan in the next 5 years?
10. Have you ever considered to stay in the senior shelters because they can provide facilities, care services and opportunities to meet the same age people?

Part 2 Sense of Seniors When Dealing with Technology to Help Aging in Place

11. Do you have any health problem?
12. Do you use internet?
13. If Q12 is Yes, Which devices are you using and how many hours do you spend surfing internet per day?

14. Have you ever used wearable devices (for example apple watch or the portable machine to remind you to do things)? If so, for what purpose and how do you like it?
15. From Q14 if not, do you like to try? And why?
16. Do you mind wearing it all day long if it helps you in term of health monitoring?
17. Do you like to have video camera or CCTV in your house both inside and outside for your own safety?
18. Do you feel comfortable to use the technology such as smart phone or computer?
19. Have you ever use the video call or social media like Skype, Face time, LINE with friends or children or app like Uber, Grab and etc.? How often you use and how do you feel about that?
20. Since you stay alone, do you think of hiring house maids or nurses to support your daily life? What is the cost?
21. There is robot developed for helping human at home, would you consider to use it and why? (show photos of Assistant Robot and how to use them)
22. How much do you plan to pay for living alone in one month?
23. Have you ever heard “Smart Home” and what do you feel about it?
24. Would you like to install the system to allow your equipment in your house operated by voice command or your own movement?
25. Would you mind to have system in the same house for detecting your daily life activities, taking records which can send directly to the doctor and your children?
26. Is price considering the important issue to develop a Smart Home?

This concludes our interview.

I appreciate your participation in my Thematic Paper project

APPENDIX B

Interview Questions

Family of Seniors/Adult Children Questionnaires

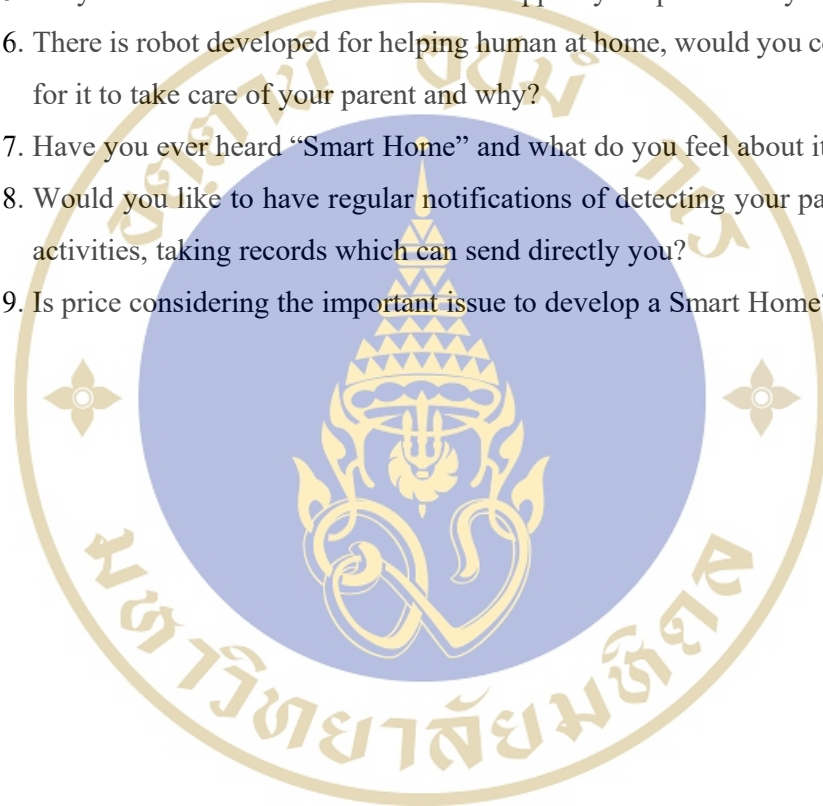
Part1 Sense of Aging in Place

1. Which kind of house are you living in? With whom?
2. What are your daily activities?
3. Have you ever heard word “Aging in Place” and what does it mean to you?
4. Did you parent stay with you? How long? And what are your feeling?
5. Would you prefer to stay in the same house with your parent after marry or move to new house in order to live together your children and spouse? (e.g. when they get married or living in other provinces or countries) Why?
6. What are your current concern about your parent, and hurdles that you are currently afraid of?
7. How much are you willing to spend, do spend, and can spend for your parent per month? Have you ever felt lonely, and how did you cope with that feeling?
8. If you have to stay alone in the same house when you are over 65 years old, what should you prepare or need to have in order to stay happily? How do you see yourself when you are the senior?
9. Have you ever considered to send your parent to stay in the senior shelters because they can provide facilities, care services and opportunities for parent to meet the same age people?
10. How do you feel send your parent to stay in the senior shelters, what concern do you have?

Part 2 Sense of Family with Technology to Help Their Parents to be Age in Place

11. Do you parent have any health problem?

12. Have you ever used wearable devices (for example apple watch or the portable machine to remind you to do things)? If so, for what purpose and how do you like it?
13. Do you want you parent to use wearable device if it helps in term of health monitoring?
14. Do you like to have video camera or CCTV in your parent house both inside and outside for parent own safety?
15. Do you trust house maids or nurses to support your parent daily life?
16. There is robot developed for helping human at home, would you consider to pay for it to take care of your parent and why?
17. Have you ever heard “Smart Home” and what do you feel about it?
18. Would you like to have regular notifications of detecting your parent daily life activities, taking records which can send directly you?
19. Is price considering the important issue to develop a Smart Home?



This concludes our interview.

I appreciate your participation in my Thematic Paper project

APPENDIX C

Demographic

1. Age
2. Gender
 - a. Male
 - b. Female
3. Education
 - a. Secondary 4 or below
 - b. Secondary 5-7
 - c. College/University or higher
4. Income (THB)
 - a. 20K or below
 - b. 20K - 40K
 - c. 40K - 60K
 - d. 60K - 80K
 - e. 80K or higher
5. Occupation
6. Marital status
 - a. Single
 - b. Single with kids (how many _____)
 - c. Married with no kids
 - d. Married with kids (how many _____)
 - e. Divorced
 - f. Widow
 - g. Others (_____)
7. What is your monthly savings?
 - a. 0
 - b. 1 – 5,000
 - c. 5,001 – 10,000
 - d. 10,001 – 20,000
 - e. 20,000 – 30,000
 - f. 30,000 – 50,000
 - g. 50,001 – 80,000
 - h. More _____