



THAI PRE-AGING ADULTS' WILLINGNESS TO LIVE
IN AGE-FRIENDLY ENVIRONMENT

BY

MISS RAITHIWA NARUEMOL

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF SCIENCE (REAL ESTATE BUSINESS)
REAL ESTATE BUSINESS
FACULTY OF COMMERCE AND ACCOUNTANCY
THAMMASAT UNIVERSITY
ACADEMIC YEAR 2020
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THESIS

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ENTITLED

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ABSTRACT

Thai pre-aging adults, 50-59 years old, will constitute the majority of the aging population by 2030. This study aims to understand how Thai pre-aging adults' perceived age-friendly environment (PAF) and their attitude towards living in age-friendly environment (ATL) influence their willingness to live in an age-friendly environment (WTL), and the total effects of PAF via ATL on WTL. Applying age-friendly environment concepts introduced by the World Health Organization, the study analyzes how Housing Indoor (HSI), Housing Outdoor (HSO), Transportation and Communication Services (TRC) and Social Participation (SOC) influence PAF.

After surveying respondents via Google Forms and testing data normality, researchers analyzed 360 samples using SmartPLS3.3.3 software. The results demonstrated that HSI, TRC and SOC were positively related to PAF, while both PAF and ATL significantly influenced WTL. The direct effect of ATL on WTL was slightly stronger than the total effect of PAF through ATL on WTL. ATL was a partial mediator of the PAF-WTL relationship. However, the direct effect of PAF on ATL was quite high. The findings enable real estate developers to focus on pre-aging adults as a main target, and to prioritize on three main attributes of residential projects for the elderly in Thailand, namely age-supportive innovations and designs, accessible and affordable transportation and communication services, and social participation.

Keywords: Housing Indoor, Housing outdoor, Transportation and Communication Services, Social Participation, Perceived Age-friendly Environment, Attitude towards Living in Age-friendly Environment, Willingness to Live in Age-friendly Environment.



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CHAPTER 1

INTRODUCTION

The aging society is no longer a novelty for Thailand. The country became classified as an ‘aging society’ in 2011 and become an ‘aged society’ in 2021. The aging population accounted for almost 18% of the total population in 2020. In other words, we can say that the aging population has accounted for a major proportion of the country’s population. In particular, the pre-aging population (50-59 years old) is currently made up of almost 9.5 million persons and will, year by year, migrate into the aging group over the next decade, considerably expanding the aging population. Looking forward the priority should be on the types of living environments Thai pre-aging adults expect for their aging life in the future to ensure their good quality of life and well-being.

To understand on a deeper level, we have learned from the experience of developed countries in initiating age-friendly communities under the concept introduced by the World Health Organization (WHO) in 2007. The age-friendly environment concept had been studied in many developed countries, for example, Canada, the USA, the Netherlands, the United Kingdom, Ireland and Australia. These countries have been familiar with aging and aged societies for several decades and have adopted age-friendly concepts to initiate communities for the elderly. All the studies concluded the advantages of age-friendly environments on improving the quality of life of the elderly. The significance level of age-friendly features that support successful age-friendly community initiatives were different in each country, subject to the fundamentals and environment in terms of social and economic elements and public services provided by central and local governments.

There were a few studies regarding age-friendly environment in developing countries, including Thailand. These studies were published in 2017 when many developing countries moved into the cycle of aging, as previously experienced in the developed countries. To prepare for future challenges in improving the elderly’s

living quality, it is important to understand their perceptions and attitudes towards living in age-friendly environment that will influence their willingness to live in such environments. It is also necessary to know which elements are significant to attract the elderly to live in age-friendly environment.

This study will aim to understand how age-friendly environment determines pre-aging adults' willingness to live in age-friendly environment during their aging life, and how their willingness to live in age-friendly environment is driven by perceptions of and attitudes towards living in age-friendly environment. This study is expected to yield outcomes which will benefit related parties, both in the government and private sector, to design future development plans and housing projects that correspond with the age-friendly environment needs of aging adults

1.1 Research Problems and Significance of the Study

Thailand is becoming an 'aged society' in 2021 (NESDC, 2019). With such rapid changes in demographic structure, both government and private entities have developed the fundamentals and environment to support the elderly's living standards and enhance quality of life. The Act on the Elderly, B.E. 2546 (A.D. 2003) has been enacted to ensure the elderly live in both age-friendly and multi-age-friendly societies and receive specific public services for their aging lives. The concept of long-term living quality has been developed and raised to facilitate the elderly to live in appropriate environments, including physical, social and psychological aspects. The age-friendly environment concept and priority age-friendliness indicators, proposed by WHO in 2007 and modified with sustainability attributes in 2015, are widely accepted to be able to help ensure a sustainable quality of life for the elderly who live their lives in an age-friendly environment. The elderly residing in a place with a good quality of life until late life is considered as the 'age in place' concept.

Age-friendly environment for the elderly's quality of life has been an interesting research study concept in Thailand for several years. Research related to quality of life indicated that age-friendly environment played significant roles in lifting

the quality of life of Thai elderly (Tiraphat, 2017). In addition, a case study has been undertaken on development guidelines for age-friendly communities in both physical and environmental aspects in the Rangsit community (Suwanprasop, 2018). The latest research focused on how age-friendly environment influence the quality of life of the elderly residing in age-friendly communities (Tiraphat, 2020).

1.1.1. Thailand: Moving Towards an ‘Aged-society’

WHO and the United Nations (UN) define society for the elderly population into three levels; (1) ‘Aging society’ is defined as more than 10% of the population are of age 60 years old or older, or more than 7% of age 65 years old or older; (2) ‘Aged society’ is more than 20% of the population are of age 60 years old or older, or more than 14% of 65 years old or older; and (3) ‘Super-aged society’ is one in which more than 20% of the population are of age 65 years old or older.

Table 1.1

Number and Proportion of Thai Elder Population Classified by Age

,000 person	2010		2020P		2030P		2040P	
Total Elderly Person (60 Years Old and above)	8,408	100%	12,622	100%	17,579	100%	20,519	100%
Young-old Elderly (60 - 69 Years Old)	4,630	55%	7,256	58%	9,260	53%	8,959	44%
Middle-old Elderly (70 - 79 Years Old)	2,708	32%	3,677	29%	5,898	33%	7,639	37%
Old-old Elderly (80 Years old and above)	1,070	13%	1,690	13%	2,421	14%	3,921	19%

SOURCE: Office of the National Economic and Social Development Council, 2019

NOTE: P-Projection

According to Thailand’s Act on the Elderly, B.E. 2546 (A.D. 2003), “the elderly” means Thai nationals of sixty years old (60 years old) and above. Table 1.1 shows the demographic structure of Thailand, which has been an ‘aging society’ since 2010. The Office of the National Economic and Social Development Council (NESDC)

estimates the number of the elderly will rise to 17.6 million persons (16.5%) in 2030. Of the total, 53% are categorized as ‘young-old’ elderly (60-69 years old), 33% as ‘middle-old’ elderly (70-79) and 14% as ‘old-old’ elderly (80 and higher).

The proportion of the aging population continuously increased, from 16.5% in 2019 to 17.9% in 2020 and is expected approximately 23% in 2021. By the year 2050, the aging rate is forecast to reach almost 30% of the total population. As shown in Figure 1.1, pre-aging adults numbered 9.7 million persons in 2020, or 14.9% of the total population (National Statistical Office, 2020). Pre-aging adults will become majority of the aging population in the next decade, accounting for around 55% of the aging population in 2030. It is important to prepare development plans to ensure an adequate quality of life for the elderly. Pre-retirement preparations for pre-aging adults have been raised in order that they can properly establish a better living quality for their aging life in the future (Benchawan, 2015).

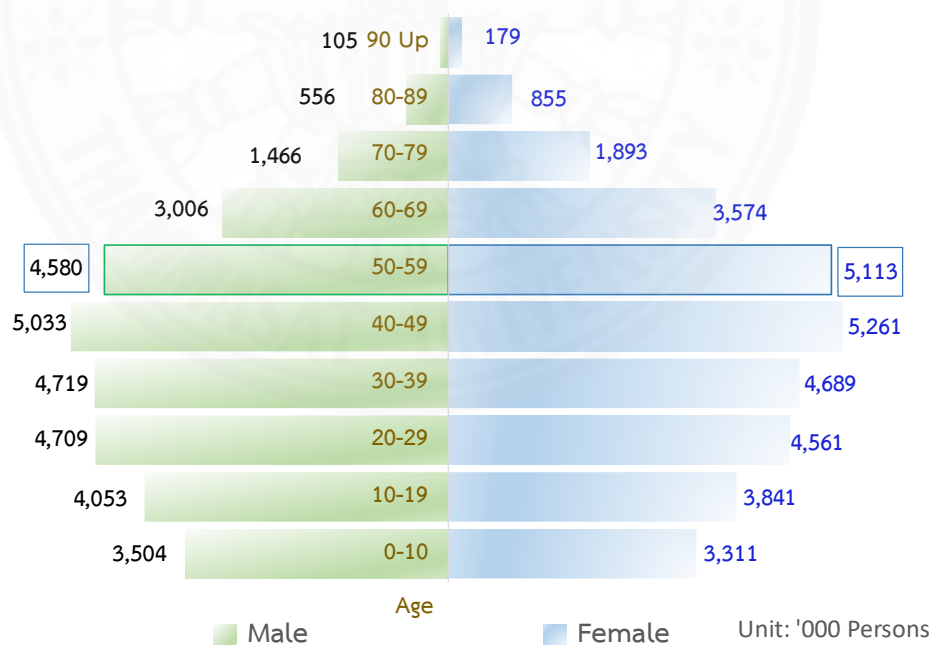


Figure 1.1 Thailand Demographic Structure in 2020 Classified by Age and Gender

Source: National Statistical Office

For more than a decade, the Thai government has realized the need to develop the surrounding environment and public services to enhance the elderly's quality of life and living standard. Government, related parties, and organizations have launched several national policies and measures to provide services, public welfare, and living environment in terms of physical, social, and economic support. Several government elder care centers have been established in many provinces nationwide, including local community care centers to promote aging in place. In addition, promotion of age-appropriate residences has been initiated in response with needs of the elderly to relocate from unfavorable current residential environments.

The first government senior complex project, called Rama-Dhanaruk Elderly Resident Project, is a concrete example of the cooperation between the Royal Thai government and Siriraj Hospital to establish an aging community surrounding by good physical and social environments and with health services for the elderly who relocate to live in the project. The first phase of the project is planned to be completed in 2022, with more than 900 units for elderly people to reside in the project.

In the private sector, several property developers have initiated residential projects with age-friendly features as part of the project structure, construction, and housing design, both indoor and outdoor. Residential projects have been developed as regular residential projects for multi-age family members and as specific residential projects for the elderly. Projects are being developed in both low-rise and high-rise configurations. To develop an age-friendly residential project, we cannot discount the fact that establishing an age-friendly environment will come with a tradeoff of higher development costs than normal residential projects

1.1.2 Age-friendly Environment

During the last two decades, the global aging population has been constantly increasing, bringing concerns over the increasing importance of aging in place. In 2007, WHO released the concept of age-friendly city, and several countries have adopted the concept and promotionally initiated communities based on age-

friendly environment. Age-friendly environments incorporate attributes and features influencing the elderly's better well-being (Menec, 2011; Nieboer & Cramm, 2017), higher quality of aging life (Flores, 2013; Au, 2017, Tiraphat, 2017), and life satisfaction (Nascimento, 2015; Xie, 2018).

WHO defines an age-friendly city as “a city with policies, services, settings and structures that support and enable people to age actively by: recognizing the wide range of capacities and resources among older people; anticipating and responding flexibly to aging-related needs and preferences; respecting their decisions and lifestyle choices; protecting those who are most vulnerable; and promoting their inclusion in and contribution to all areas of community life” (WHO, 2007).

According to WHO's age-friendliness framework, the eight elements of age-friendly environment have been initiated and conducted to establish age-friendly communities for the elderly, to support them to live their aging life in age-friendly environment. The eight elements of age-friendliness are (1) outdoor space and buildings, (2) transportation services, (3) housing, (4) social participation, (5) respect and social inclusion, (6) work and civic engagement, (7) communication and information, and (8) community and health services. Details are explained in Appendix A.

1.1.3 Perception and Attitude

Perception refers to phenomenon an individual experienced when actively participated and involved in environment attributes. When an individual experienced or confronted with stimuli or situation, making the individual perceived or interpret into negative or positive attitude (Pickens, 2005).

Perception and attitude are closely related. When an individual experienced or confronted with stimuli or situation, making the individual perceived or interpret into negative or positive attitude (Pickens, 2005). However, both perception and attitude may be substantially different from reality. Attitude is a mental state, related to belief, feeling and value, which motivates behavior or action (Altmann, 2008). Attitude represents an individual's thoughts, feelings, and behaviors on environment surroundings, both physical and social attributes.

1.1.4 Willingness

Willingness is a stage of the human behavior process that an individual intends to take an action regarding to perception and attitude on the outcome yielding from making such action. This process could be explained and explored for behavior theories, such as theory of willingness to pay, ecological theory of aging, person-environment theory, theory of planned behavior and theory of consumer behavior. The relationship of perception, attitude and behavioral intention are positive (Ajzen, 1991; Lai, 2016). The living environments are considered as attributes stimulating an individual's perception, attitude, and behavior, in positive or negative direction, to respond with the stimuli.

The elderly's living environment played important roles in supporting aging life, as it correlates with the elderly's quality of life through physical, social, and public service factors in the living community (Nieboer & Cramm, 2017). The Elderly modernized their lifestyles and realized the importance of keeping in good health, self-care, greater independence, and have increasingly adopted new technologies and connectivity via social communication (Bradley, 2013). Their attitudes towards changes in the surrounding environment have become more opened and flexible. For example, relocation to live in residential projects for the elderly has been more positively accepted due to a more open-minded attitude. Modern and functional designs of residential projects for the elderly noticeably improved the retirement community image in alignment with the needs of active elders (Lee, 2020).

Currently, wellness and elderly residence projects developed by private companies are more age-friendliness. Positive changes in the elderly's lifestyles, more social connectivity, and positive attitudes towards living in age-friendly environment has encouraged the elderly's willingness to live in age-friendly environment, due to their perception of the good quality of their aging life or their life satisfaction influenced by living in age-friendly environment (Lim, 2020).

Interesting points for study were what living environment attributes are perceived as age-friendly among pre-aging adults in Thailand, how perception of pre-

aging adults in age-friendly environment influences their attitude towards living in the age-friendly environment, and how their attitudes towards living in age-friendly environment influence their willingness to live in age-friendly environment during their aging life.

1.2 Research Questions and Objectives

1.2.1 Research Questions

- (1) How housing indoor influences pre-aging adults' perceived age-friendly environment.
- (2) How housing outdoor influences pre-aging adults' perceived age-friendly environment.
- (3) How transportation and communication services influence pre-aging adults' perceived age-friendly environment.
- (4) How social participation influences pre-aging adults' perceived age-friendly environment.
- (5) How pre-aging adults' perceived age-friendly environment influences their attitude towards living in age-friendly environment.
- (6) How pre-aging adults' perceived age-friendly environment influences their willingness to live in age-friendly environment.
- (7) How pre-aging adults' attitude towards living in age-friendly environment influence their willingness to live in age-friendly environment.

1.2.2. Research Objectives

- (1) To study how housing indoor influences pre-aging adults' perceived age-friendly environment
- (2) To study how housing outdoor influences pre-aging adults' perceived age-friendly environment
- (3) To study how transportation and communication services influence pre-aging adults' perceived age-friendly environment
- (4) To study how social participation influences pre-aging adults' perceived age-friendly environment
- (5) To study how pre-aging adults' perceived age-friendly environment influences their attitude towards living in age-friendly environment.
- (6) To explain how pre-aging adults' perceived age-friendly environment influences their willingness to live in age-friendly environment for their aging life.
- (7) To explain how pre-aging adults' attitudes on living in age-friendly environment influence their willingness to live in age-friendly environment for their aging life.

1.3 Research Benefits

The study of Thai pre-aging adults' willingness to live in age-friendly environment will yield the following benefits:

- (1) To know perceptions of pre-aging adults on attributes of age-friendly environment in their lives.
- (2) To understand the influence of pre-aging adults' perceived age-friendly environment on their attitude towards living in age-friendly environment and their willingness to live in age-friendly environment.

- (3) To explain that pre-aging adults' attitude on living in age-friendly environment influences them to have a willingness to live in age-friendly environment for their aging life.
- (4) The private sector can apply this research study to develop age-friendly and age-supportive residential projects in the future, which correspond with pre-aging adults' willingness to live in age-friendly environment.
- (5) The government can utilize this research study to create guidelines for promoting and developing age-friendly communities and supporting a better quality of life for the elderly.

1.4 Research Definition

To give an understanding of this paper's analysis, the definitions of constructs and key terms in the conceptual framework are presented in Table 1.2. References for defining each construct are also included in the table.

Table 1.2

Terms and Definition

Term	Definition	Reference
Pre-aging adults	Defined as Thai resident adults born between 1962 and 1971. They are currently 50-59 years old, according to the National Statistical Office (NSO). They can presently live independently as active adults, by capably handling all their needs and affairs on their own.	(NSO)
The elderly	Refers to Thai people aged 60 years and older, according to The Act on the Elderly, B.E. 2546 (2003 A.D.). The elderly in the study refers to current Thai pre-aging adults that will demographically migrate into the elderly category during the next decade.	(The Act on the Elderly, B.E. 2546, 2003 A.D.)

Table 1.2

Terms and Definition

Term	Definition	Reference
Housing Indoor (HSI)	Defined as features inside residences and inside-fence boundary area, house structure, interior design, functions, physical, and maintenance condition that support the elderly to live independently, functionally, comfortably, healthily, secured and safely.	(Luciano 2019) (Zaman & Thornton, 2018) (Nascimento, 2015)
Housing Outdoor (HSO)	Defined as the attributes outside residence and outside-fence boundary surroundings with a friendly environment, green space, sanitization and hygiene, safety and security, and supporting psychological and health functions, which enhance pre-aging adults' quality of life during their aging life.	(Lim, 2020) (Zaman & Thornton, 2018) (Thepparp & Uemura, 2017) (Nascimento, 2015)
Transportation and communication services (TRC)	Covers various types of transportation and communication services for elderly mobility and communication to undertake their usual activities, in terms of convenience, availability, affordability, accessibility and quality, to support the elderly to live a normal life, to move safely, to participate as usual and to live independently.	(Gibney & Shannon, 2018) (Zaman & Thornton, 2018) (Tang & Pickard, 2008)
Social participation (SOC)	Refers to opportunities and availability of accessible and affordable knowledge and social activities, in which the elderly can jointly interact with family members, relatives, friends and community members.	(Thepparp & Uemura, 2017) (Orpana, 2016) (Emlet & Moceri, 2013)

Table 1.2

Terms and Definition (Cont.)

Term	Definition	Reference
Perceived Age-friendly environment (PAF)	Refers to the phenomena pre-aging adults perceived that they can actively participate in and be involved in, which are supported by environmental attributes that effectively accommodate their needs in aging life and bring about their quality of life.	(Thepparp & Uemura, 2017) (WHO, 2015) (WHO, 2007)
Attitude towards living in age-friendly environment (ATL)	Indicates a rational thinking or feeling about living in age friendly environment. Attitude towards living in age-friendly environment can also be described as pre-aging adults' favorable or unfavorable evaluation toward living in age-friendly environment.	(Lim, 2020) (Tang & Pickard, 2008)
Willingness to live in age-friendly environment (WTL)	Refers to the stage at which pre-aging adults intend to live in a current or new residence as aging in place for their aging life, when they perceive and feel the advantages and friendliness on their quality of aging life.	(Lim, 2020) (Zhang, 2018)

CHAPTER 2

REVIEW OF LITERATURE

2.1. Concept, Theory and Literature

This topic presents the concept, theory and literature review related to constructs and relationships of constructs, in order to understand the rationales behind the constructs, the relationships and the conceptual framework of the study.

2.1.1. Age-friendly Environment Concept

The age-friendly environment concept was introduced by WHO in 2007 with a conceptualized framework that age-friendly environment supported and enhanced the elderly's quality of life and well-being during their aging life, as previous stated in Topic 1.1.2. The concept had been implemented and studied in many developed countries that had experienced aged societies over two decades; Canada (Novek & Menec, 2013; Orpana, 2016), United States (Emlet and Mocerri, 2012; Greenfield, 2017), United Kingdom (Steels, 2015), Netherlands (Nieboer and Cramm, 2017), South Australia (Zaman & Thornton, 2018) and Ireland (Gibney and Shannon, 2018). Only a few studies related to age-friendly concepts had been conducted in the developing countries (Steels, 2015), including Thailand.

To enhance the elderly's living quality, age-friendly services and facilities of transportation, housing, recreation, and health care were available and accessible (Smith, 2013). Age-friendly environment in terms of social and physical environment attributes supported the elderly to achieve overall well-being (Nieboer and Cramm, 2017). In emerging Asian economies like Malaysia, Lai (2016), age-friendly environment with social connectivity influenced the elderly to live actively.

WHO's age-friendly concept had been implemented in several countries, enabling the elderly to optimize their living with health sustainment, and social and economic participation. These factors supported the elderly to age in place without the need to move (Au, 2016). The physical features of the environment were

key influences on the elderly's mobility, social participation, security and health (Cachadinha, 2012). In addition, Cachadinha's study in Turkey provided empirical support for a correlation between the elderly's ability to walk to their routine life destinations and their health outcomes.

Age-friendly physical and social attributes played important roles in the elderly's quality of life in Thailand, (Thepparp & Uemura, 2017; Tiraphat, 2017; Assawamaitree, 2017; and Tiraphat, 2020). Physical and social environments, and community security were identified as age-friendly environment at the sub-district level (Tiraphat, 2017). To promote active aging among the elderly, there have been surveys of age-friendly elements in the capital cities of Japan, Malaysia, Myanmar, Vietnam and Thailand (Tiraphat, 2020). The surveys examined the relationship of age-friendly environment, active aging, and the quality of life of the elderly. Outcomes from the study indicate age-friendly environment directly and indirectly influences the elderly residing in age-friendly environment to attain active aging.

2.1.2. Age-friendly Indicators

With the eight elements of age-friendly environment suggested by WHO, we needed to look at what indicators are important for each age-friendly element. In an age-friendly community, physical attributes and social environment are designed to enable and support the elderly to "age actively" with safety, security, healthy, and participation in civic and economic society. With differences in aging structure, geographic, social, economic and political traits, priority indicators for age-friendly environments were inevitably different for each community and each country. In consequence, more experienced countries, explored priority indicators determining age-friendly environment, in order that the government or local governor could initiate successful age-friendly communities by providing effective services, facilities and age-appropriate attributes for good living quality of the elderly.

A set of age-friendliness Indicators for local communities had been developed and suggested as age-friendly housing checklists (Luciano, 2019), and as priority indicators in many countries, including Ireland (Gibney and Shannon, 2018),

South Australia (Zaman & Thornton, 2018) and Canada (Orpana, 2016). Detailed lists of their explored indicators were described in Appendix B.

From reviewing several literatures of age-friendliness indicators, extending from WHO's age-friendly concept, the summary of age-friendly environment attributes and indicators was shown as a matrix in Figure 2.1 below.

Age-friendliness Attributes and Key Indicator Matrix			
Physical Environment	Outdoor Space and Building	Transportation	Housing
Indicators	Clean, pleasant and well-maintained local public areas	Accessible and affordable transportation services	Accessible information to obtain assistance with home maintenance and modification
	Age-suitable recreational facilities	Adequate and convenient parking area that is age-suitable	Older people feel safe, secure and comfortable in their homes
	Sufficient open green spaces, adequate seating and suitable pathways	Adequate local community transport services for disable people	Practical regulations for and available information about age-suitable homes modification
	Convenient and safely footpaths, supportive for mobility	Promoting driving education and refreshing courses for all	Age-suitable designed houses (i.e. step-free access, wheelchair, accessible, etc.)
Social Environment	Social Participation	Respect and Social Inclusion	Civic Participation
Indicators	Easily access to local social venues and local events	Valuable accepted and respectful in social interactions and community involvement	Local decision-making involvement and represented in public affairs
	Age-suitable time to attend entertainment, leisure, and sports activities	Sufficient and sustained assistance and community support	Accessible to training and educational opportunity in their local community
	Opportunity to meet family, friends, relatives or colleagues	Protected from experienced age-related discrimination	Available information about local volunteering and paid employed opportunities
Public Services	Communication and information	Community and Health Services	
Indicators	Easy-to-understand information about local services and amenities	Easily and safely access to use health and welfare center	
	Accessible and affordable to information technology and internet/wifi services	Knowable on how to access in-home care and support services	
	Accessible to and assisted to understanding essential information and knowledge	Accessible to programs and information on health, mental and physical education.	

Figure 2.1 Age-friendly Environment and Age-friendly Indicator Matrix

2.1.3. Key Constructs

This study selected key indicators that were prioritized from the above-mentioned academic studies in experienced countries, for incorporation with the review of theoretical and analytical studies regarding significance and successful age-friendly elements. The study applied selected indicators and reviewed literatures to detail the questionnaire and to design a set of analytical determinants for undertaking the research.

The age-friendly environment under the WHO concept consists of eight elements grouped into three main environment aspects, which are physical, social, and public service environment. These three aspects were used for explaining the quality of life (Nieboer and Cramm, 2017). Physical aspects include outdoor space and buildings, and housing and transportation, while social aspects include social and civic participation, and community support. Public services refer to health and communication services. Sustainable age-friendly environment was studied in terms of their influence on the elderly's willingness to move to the retirement residence in Malaysia (Lim, 2020)

2.1.3.1. Age-friendly Environment Attributes

A study in Istanbul, investigating how the living environment affects the elderly, showed that the physical environment influenced the mobility, social participation, security, and health of the elderly (Cachadinha, 2012). Housing indoor designed with age-appropriate functions could protect the elderly from accidents or supported their daily mobility and routine activities (Zaman & Thornton, 2018; Orpana, 2016), while sufficient and accessible transportation enabled the elderly to move conveniently to their daily-life places or to participate in social activities (Gibney and Shannon, 2018). Convenient and affordable access to transportation services provided opportunity for the elderly to actively participate in activities and socially interact with family members, friends, and community members (Lai, 2016). Transportation services and social participation were main age-friendly elements for the elderly's life satisfaction (Au, 2016).

In May 2020, the concept of ‘aging in sustainable and smart cities’ was introduced (UNECE, 2020). The new concept recommended strategies developed for age-friendly environments and focused on three domains: housing, green and public spaces, and transport as important factors to ensure that the elderly are able to enjoy a good standard of living in an age-friendly environment. The concept addressed the question of how all stakeholders (policy makers, private and community members) could design a sustainable age-friendly environment using new technologies that served all generations, foster inter-generational solidarity, and ensured the aging generation is not left behind. The three domains of an age-friendly environment consisted of: (1) Housing: in terms of sustainable, smart, acceptable, affordable, secure, safe, functional, and comfortable. (2) Green and public spaces: in scope of well-maintained, acceptable, safe and secure. (3) Transport: in the view of investable, sustainable, available, affordable, convenient, accessible, as well as safe and secure.

Age-friendly environment applied in this study consists of four environmental aspects, which were housing indoor and housing outdoor nominated for physical aspects, transportation and communication services nominated for public services, and social participation nominated for social aspect.

(1) Housing Indoor (HSI)

Housing attributes played significant roles in supporting the elderly’s living and were studied to be priority indicators for an age-friendly environment (Zaman & Thornton, 2018; Orpana, 2016). Age-friendly housing reflected age-appropriate housing attributes that supported the elderly for aging in place without losing independence (Luciano 2019; AARP, 2010). Age-friendly housing attributes were as follows:

- | | |
|--------------------------|------------------------|
| 1. Affordability | 5. Essential services |
| 2. Community connection | 6. Age-suitable Design |
| 3. Service accessibility | 7. Modification |
| 4. Safety and security | 8. Well maintenance |

Housing indoor represented traits or attributes that comprised comfort, accessibility, safety, and hygiene, which supported aging life. A study in Australia embraced technology that brought about sustainable and age-friendly housing, to ensure independent living for the elderly (Karol, 2004). Sustainable housing in terms of energy usage and water consumption were to achieve cost savings, or in other words, partly relieved the elderly's financial burden. In Brazil, housing conditions and the degree of satisfaction in housing significantly influenced the elderly's decision for age in place (Nascimento 2015).

Housing design was another attribute supporting the sustainable health of the elderly with green space, nature, and fresh air (Zaman & Thornton, 2018). The age-appropriate design of housing was a means of supporting the elderly's feeling of security and safety from intruders and crime (Lim, 2020; Zaman & Thornton, 2018; Orpana, 2016), and enhancing daily living quality (Zaman & Thornton, 2018; Orpana, 2016), avoiding environmental threats like pollution and natural disasters. Age-suitable physical housing conditions, typology, size, and quality significantly affected the elderly's mental well-being (Sun, 2020).

(2) Housing Outdoor (HSO)

Housing outdoor represented the attributes surrounding a residence such as a friendly environment, green space, sanitation and hygiene, safety and security, and psychological and health support functions, which enhance pre-aging adults' quality of aging life (Nascimento, 2015; Thepparp & Uemura, 2017; Nieboer and Cramm, 2017). Houses or residences located in places that were walkable, with accessible services, and safety from crime were likely to build a better quality of aging life (Lim, 2020). The surrounding environment of houses was positively associated with the elderly's health and active aging (Smith, 2013). The physical environment, therefore, became specifically important for the aging life of the elderly. In addition, green open space and safety were important environmental factors that several studies found to be age-friendly attributes and priority indicators (Sun, 2018; Zaman & Thornton, 2018; Orpana, 2016; Lim, 2020).

(3) Transportation and Communication Services (TRC)

Transportation and communication services are one of the age-friendly elements that provide significant roles in supporting the elderly's living and are priority indicators for age-friendly environment (Zaman & Thornton, 2018; Orpana, 2016). Transportation and communication services cover any types of services to facilitate the elderly's mobility and communication to undertake their usual life activities. The services were considered in terms of sufficiency, convenience, availability, affordability, and accessibility to support the elderly to live a normal life, to move safely, to participate socially as usual and to live independently.

Transportation services were always the constructs in several analysis model structures when researchers studied age-friendly environment, active aging (Lai, 2016; Lim, 2020) and quality of aging life (Novek and Menec, 2013; Au, 2016). When considering transportation services, it is normal to think about infrastructure and mass transportation for land, air and water. However, in an age-friendly perspective, transportation services could be facilities at the community level that enabled age-convenient access for daily life and were perceived as facilities by older adults (Cachadinha, 2012). Various types of transportation facilitated the elderly to easily access to public spaces (Srichuae, 2015). Transportation facilities included condition of pavements, walkable paths, community roads and sidewalks, which were important to the elderly's mobility, safe travel and connectivity with family, friends, neighbors and community members (Lim, 2020; Zaman & Thornton, 2018; Orpana, 2016),

Information and communication technologies are essential facilities in modern daily life, which can improve the elderly's living quality (UNECE, 2020). Available and adoptable new technologies have been becoming challenging aging-environment (Wahl and Oswald, 2010). Accessibility to communication channels and internet as usual in daily life is indispensable. This study consolidated both transportation and communication services as an age-friendly environment construct.

(4) Social Participation (SOC)

In the age-friendly environment context, social participation were a means to support the elderly's mental and physical health. Loneliness,

sadness, and isolation were debilitating psychological conditions for the elderly that can lead to chronic illness or disease. Having opportunities to interact and participate in available, accessible, and affordable social activities were considered one key age-friendly environment condition for the elderly (WHO, 2007).

Social participation could be explained through a wide range of meanings and various dimensions. It could be social support from the family, interaction with family members, friends and neighbors, social cohesion, social trust and social relationships (Au, 2016; Lai, 2016). For the other dimension, social participation covered group interactions or interpersonal relationships within the same generation or inter-generational. In short, social connectedness could reflect in social interaction and reciprocity, and structural community needs (Emlet and Mocer, 2012).

Some studies elucidated the significant role of social connectedness and interaction with aging in place (Emlet and Mocer, 2012) and with active aging (Lai, 2016). Their study reinforced the role of social participation and connection in establishing sustainable age-friendly environment for the elderly. Opportunities for social connections were key for the elderly to improve their health and well-being (Lai, 2016; Patricia, 2019). Age vulnerability was influenced by interactions between person, social, and environment context (Vafaei, 2016). The study result in Malaysia (Lai, 2016) found social connectedness as a mediating role between relationship of age-friendly environment and the active aging.

Social participation was related to family conflicts and loneliness of the elderly (Burke, 2012). To establish age-friendly social environment, family and neighbor interactions could mitigate the elderly's loneliness. In Malaysia, Lim (2020) showed that a sustainable social environment included an independent and secure residence, privacy protection, service accessibility, social interaction encouragement, lifetime learning and living improvement. Inter-generational interaction also eliminated the elderly's social isolation, loneliness, and depression. In addition, the elderly was valued and respected within the community when they had opportunities in learning, participating, and connecting with the younger generation.

2.1.3.2. Perceived Age-friendly Environment (PAF)

Age-friendly environment was driven by the physical, social and public service environment. These environmental attributes could potentially impact on the elderly's daily life behavior, health and social relations. Perceived age-friendly environment refers to the phenomenon that pre-aging adults perceive that they can actively participate in, be involved in, and supported by age-friendly environment attributes that effectively accommodated their needs in independent aging life (Karol, 2004) and brought about their quality of aging life (WHO, 2007; WHO, 2015; Thepparp & Uemura, 2017).

There were few studies regarding perception of WHO's age-friendly environment in Thailand. Perception of eight age-friendly elements significantly related to the mental health status of Thai elderly in Banphong Sub-district (Assawamaitree and Hongsrnagon, 2017). The latest outcomes from the study in Thailand indicated that WHO's age-friendly elements directly influenced active aging, as well as directly and indirectly the quality of life of the elderly residing in age-friendly environment (Tiraphat, 2020). The study revealed that the three age-friendly elements that responders perceived to be sufficient in their current communities were social respect and inclusion, community and health services, security in house surroundings and availability of health information. The age-friendly environment attributes that were not sufficient in the community included accessibility to internet connections at home, age-appropriate car parking, and formal and informal educational training.

2.1.3.3. Attitude Towards Living in Age-friendly Environment (ATL)

Attitude towards living in age-friendly environment indicated a rational thinking about living in age-friendly environment. Attitude towards living in age-friendly environment could also be described as a pre-aging adults' favorable or unfavorable evaluation toward living in age-friendly environment. Attitude was a key driver for an individual to perform the behavior. Therefore, attitude played a mediated role to link age-friendly features through behavior, which in consequence induce willingness to live in age-friendly environment (Lai, 2016; Zhang, 2018; Lim, 2020, Bu,

2020). Favorable attitude influenced willingness to behave in a positive way. Studies in many countries have shown the influence of favorable attitude on predicting an individual's behavior in a positive direction (Ajzen, 1991).

2.1.3.4. Willingness to live in Age-friendly Environment (WTL)

Willingness was a stage of intention to perform behavior regarding an individual's attitude on the perceived outcome from conducting such behavior. The relationship between attitude towards living in age-friendly environment and behavioral intention was positive (Lim, 2020). Perception of good quality of life from favorable age-friendliness is an influencing factor for pre-aging adults to live in age-friendly environment. A willingness to live in age-friendly environment could be reflected through an individual's planning, interest, focus, tending and/or intending to live in age-friendly environment until the end of life. In making a choice of behavior, to pay more or to incur higher cost in exchange for living in age-friendly environment reflected an individual's willingness to live in age-friendly environment (Mandell, 2010; Tan, 2011).

2.1.4. Review of Theory and Concept

There were a few theories that could explain the relationship related to living environment attributes, perception, attitude, and willingness (or behavior intention). Willingness to pay (WTP) theory could be used to explain or evaluate consumer behavior. Number of related academic papers apply WTP concepts, including WTP for sustainable housing in Sweden (Mandell, 2010), WTP for housing in sustainable neighborhoods in Malaysia (Hong, 2011), and for accessible elderly housing in Korea (Lee, 2020).

The concept of Person-Environment (P-E) for aging (Wahl and Oswald, 2010) concluded that environment factors crucially determined the elderly's daily living behavior, mental health (Park & Lee, 2017) and well-being during their aging life. The P-E theoretical extension was applied to explain housing typology and elderly's perceived age-friendliness in Hong Kong (Sun, 2018).

The theory of planned behavior (TPB) was another theory explained that behavior can be predicted directly by using perceived behavioral control and behavioral intention (Ajzen, 1991). Ajzen concluded that attitude, perceived behavior control and subjective norm significantly influenced intention to behave. In Malaysia, Lim (2020) studied the factors driving a willingness to move into a retirement village, applying the theory of planned behavior. He incorporated the influence of social, environment and economic sustainability on the elderly's willingness to relocate to live in the retirement village, using favorable attitude on sustainable outcomes as a mediator to link the relationship.

Willingness to relocate was another theory related to age-living satisfaction, which could be explained by the Push-Pull Theory of Migration (Lee, 1966). When the factors surrounding the elderly's daily living were perceived in a negative direction, these represented push factors for the elderly's willingness to move from these living environments, which was called 'age relocation'. On the other hand, a satisfactory living environment was considered a pull factor attracting the elderly to continue staying in that environment, which was called 'age in place'. To support development of urbanization, the theory had been widely adopted for evaluating people migration from the rural to the urban areas. The study that applied the push and pull framework found several factors involved in the relocation of the elderly, and important factors were supportive housing (Franco, 2019) and satisfactory housing (Erickson, 2006).

In evaluating willingness influenced by multiple attributes surrounding the elderly, both physical and social, two theories had been extended for the age-friendliness study. These theories were 'the ecological theory of aging' and 'the theory of consumer behavior', which were applied for this research study and explained as follows:

2.1.4.1. Ecological Theory of Aging: The Lawton Model

Lawton and Nahemow introduced the ecological theory of aging (ETA) in 1973, called the Lawton Model. The model explains the positive relationship between the elderly's perception regarding physical and social

environment aspects to their aging life and their attitude towards both aspects. Attitude reflected an individual's psychological opinion about the surrounding environment and could reflect as an individual's behavioral action (Ajzen and Fishbein 2005). An individual's favorable attitude was more likely to influence behavior in a positive direction, and vice versa.

The Lawton Model was a framework for understanding human behavior in terms of the involvement between age-friendly environment attributes and attitude towards interacting with such attributes (Menec, 2011; Emlet and Moceri, 2012; Lai, 2016). Social connectedness and social relationships among neighbors in building age-friendly communities were important determinants for well-being (Lai, 2016) and support the elderly to age in place (Emlet and Moceri, 2012; Nieboer and Cramm, 2017).

Lawton's ETA was adopted to explain the attitude of individuals as the effective factor in driving behavior in Malaysia (Lim, 2020). Lim's study brought about the positive relationship between perceived sustainable social and physical environmental traits and the elderly's attitude towards senior retirement villages.

To explain attitude towards living in age-friendly environment, this study employed Lawton's ETA to construct a hypothesis of the relationship between age-friendly environment attributes, perceived age-friendly environment attributes and attitude towards living in age-friendly environment as presented in Figure 2.2. Age-friendly environment in this study included housing indoor, housing outdoor, transportation and communication services and social participation.



Figure 2.2 Applied Lawton's Ecological Theory of Aging

The hypotheses constructed for the relationship are as follows:

- H1 (+): Housing Indoor is positively related to pre-aging adults' perceived age-friendly environment
- H2 (+): Housing outdoor is positively related to pre-aging adults' perceived age-friendly environment
- H3 (+): Transportation and communication services are positively related to pre-aging adults' perceived age-friendly environment
- H4 (+): Social participation is positively related to pre-aging adults' perceived age-friendly environment
- H5 (+): Pre-aging adults' perceived age-friendly environment is positively related to their attitude towards living in age-friendly environment.

2.1.4.2. The Theory of Consumer Behavior

The theory of consumer behavior was formed by human behavior theory, which explained an individual's processes interacting with environmental stimuli (Walters, 1974). The process covered an individual's thoughts, feelings, and actions. Consumer behavior was an individual's decision process in purchasing goods and services. Perception, attitude, and willingness were pre-purchase decisions in the behavior process. Once an individual was motivated by the surrounding environment, they would perceive the motivation, which forced them to have behavior intention (Palacio-Fierro, 2020). In other words, the behavior process was driven by stimuli that influence consumers' perception and consequently determine a willingness to consume. Attitude referred to what an individual feels, thinks or believes, positively or negatively, when perceiving the motivation, and induced an individual to make a behavior reaction (Palacio-Fierro, 2020).

To explain the relationship between perception and willingness, and between attitude and willingness, many studies employed the gerontology theory and the ecological theory of aging, and consumer behavior theory. These studies explored a positive relationship between attitude and willingness or intention to make an action, such as willingness to pay for sustainable housing

(Mandell, 2014), to stay in green hotel (Teng, 2015), to purchase green housing (Zhang, 2018) and to relocate into a retirement community (Lim, 2020).

A study in Taiwan (Lu, 2011) revealed a positive correlation between attitude on aging and continued working intention in old adults. In studying a purchase intention towards green homes in China, Tan (2013) concluded that the intention was influenced by a favorable attitude towards staying in a green home. A study by Judge (2019) also suggested the same result in line with Tan, regarding the positive influence of consumers' favorable perception and attitude on sustainable housing purchase intention.

The literature review provided a reasonable confidence in explaining the relationship of perceived age-friendly environment and attitude towards living in age-friendly environment with willingness to live in age-friendly environment. Both perceived age-friendly environment and attitude towards living in age-friendly environment were positively related with willingness to live in age-friendly environment, as displayed in Figure 2.3.

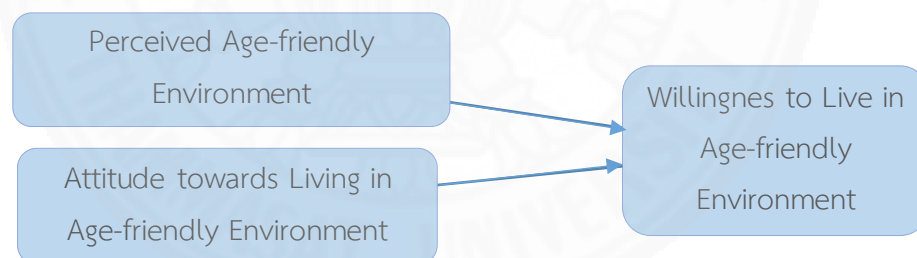


Figure 2.3 Applied Theory of Consumer Behavior

The hypotheses constructed for the relationship are as follows:

- H6 (+): Pre-aging adults' perceived age-friendly environment is positively related to their willingness to live in age-friendly environment.
- H7 (+): Pre-aging adults' attitude towards living in age-friendly environment is positively related to their willingness to live in age-friendly environment.

2.2. Hypothesis

In summary, this study evaluates seven hypotheses as follows,

- H1: Housing Indoor is positively related to pre-aging adults' perceived age-friendly environment
- H2: Housing outdoor is positively related to pre-aging adults' perceived age-friendly environment
- H3: Transportation and communication services are positively related pre-aging adults' perceived age-friendly environment
- H4: Social participation is positively related to pre-aging adults' perceived age-friendly environment
- H5: Pre-aging adults' perceived age-friendly environment is positively related to their attitude towards living in age-friendly environment.
- H6: Pre-aging adults' perceived age-friendly environment is positively related to their willingness to live in age-friendly environment.
- H7: Pre-aging adults' attitude towards living in age-friendly environment is positively related to their willingness to live in age-friendly environment.

2.3. Conceptual Framework

Conceptual framework illustrated the theoretical concept to understand and explain the relationship of variables in the structural model and to accomplish objectives of the study. The analytical framework was conceptually structured, based on reviewing of literatures related to measured variables, latent constructs, theoretical and relationship as shown in Table 2.1 and Table 2.2.

2.3.1. Summary of Construct and Relationship Review

The study integrated the ecological theory of aging and the theory of planned behavior in elucidating the elderly's willingness to live in age-friendly environment. There are seven constructs in the relationship model. Age-friendly environment constructs are housing indoor (HSI), housing outdoor (HSO), transportation services and communication (TRC) and social participation (SOC). These four constructs influence perceived age-friendly environment (PAF) of the elderly. By exploring the ecological theory of aging, positive attitude would be influenced by favorable perceived physical and social attributes. In other words, the ecological theory of aging explained the positive relationship between attitude and perceived age-friendly environment.

Under the concept of this study, Thai pre-aging adults' perceived favorable age-friendly environment was a factor driving their behavior intention, which reflected as willingness to live in age-friendly environment. Their attitude towards living in age-friendly environment also influenced willingness to live in age-friendly environment with a positive relationship. Their relationship could be explained by the theory of consumer behavior. Perceived favorable age-friendly environment and positive attitude towards living in age-friendly environment both bring about positive willingness to live in age-friendly environment. These conceptual relationships are evidenced by studies of sustainable features of housing (Mandell, 2014), green hotels (Teng, 2015), green housing (Zhang, 2018) and retirement village (Lim, 2020).

Table 2.1

Construct Review

Author	Type/Topic**	HSI	HSO	TRC	SOC	PAF	ATL	WTL	QoL/LS*
(Lawton and Nahemow, 1973)	Theory/ETA					/	/		
(Palacio-Fierro, 2020)	Theory/TCB					/	/	/	
(Chaniotakis, 2010)	Theory/TCB					/	/	/	
(Chen, 2008)	Theory/TCB					/	/	/	
(Bu, 2020)	Theory/TCB/TPB					/	/	/	
(Ajzen, 2011)	Theory/TPB					/	/	/	
(Lee 2019)	Theory/TPB					/	/	/	
(Pickens, 2005)	Theory/TPB					/	/	/	
(Menec, 2011)	Research/PAF					/			
(Greenfield, 2017)	Research/PAF				/	/			
(Lee, 2007)	Research/PAF					/			
(Au, 2017)	Research/PAF			/	/	/			X
(Lehning, 2017)	Research/AFE					/	/		
(Patricia, 2019)	Research/AFE					/			
(Xie, 2018)	Research/ATL						/		X
(Mandell, 2014)	Research/ATL						/		
(Zhang, 2018)	Research/ATL/WTL						/	/	
(Lee and Yoo, 2020)	Research/WTL							/	
(Dube, 2018)	Research/WTL							/	
(Oswald & Rowles, 2006)	Research/WTL							/	

Remarks: *QoL is Quality of Life, LS is Life Satisfaction X is outside the scope of this study

**AFE is Age-friendly Environment, TPB is Theory of Planned Behavior,
ETA is Ecological Theory for Aging, and TCB is Theory of Consumer Behavior

Table 2.1

Construct Review (cont.)

Author	Type/Topic	HSI	HSE	TRC	SOC	PAF	ATL	WTL	QoL/LS*
(WHO, 2007, 2015)	AFE Concept	/	/	/	/				X
(Gibney & Shannon, 2018)	Research/Indicators	/	/	/	/	/			
(Zaman & Thornton, 2018)	Research/Indicators	/	/	/	/	/			
(Thepparp and Uemura, 2017)	Research/Indicators	/	/	/	/				
(Orpana, 2016)	Research/Indicators	/	/	/	/	/			
(Novek and Menec, 2013)	Research/Indicators	/	/	/		/			X
(LIM, 2020)	Research/AFE	/	/	/	/	/	/	/	
(Judge, 2019)	Research: PAF/ATL/WTL	/	/			/	/	/	
(Sun, 2017)	Research/AFE	/	/	/	/	/			
(Lai, 2016)	Research/AFE,	/	/	/	/	/			
(Tan, 2013)	Research: ATL/WTL	/	/					/	
(Lucino, 2019)	Research/AFE	/	/	/	/				
(Nascimento, 2015)	Research/AFE	/	/						X
(Karol, 2004)	Research/AFE	/							
(Tiraphat, 2020)	Research/AFE	/	/	/	/				X
(Cachadinha, 2012)	Research/AFE		/						
(Greenfield, 2017)	Research/AFE			/					X
(Srichuae, 2015)	Research/AFE			/					
(Shen & Perry, 2014)	Research/AFE			/					
(Tang & Pickard, 2008)	Research/AFE			/					
(Bradley, 2013)	Research/AFE			/	/				
(Tiraphat, 2017)	Research/AFE/PAF			/	/	/			
(Vafaei, 2016)	Research/AFE/PAF/ATL				/	/	/		
(Burke, 2012)	Research/AFE				/				
(Emlet & Mocer, 2013)	Research/AFE				/				

Remarks: *QoL is Quality of Life, LS is Life Satisfaction X is outside the scope of this study

Table 2.2

Relationship Review

Author	Type/Topic*	AFE → PAF				PAF, ATL, WTL		
		H1	H2	H3	H4	H5	H6	H7
		HSI → PAF	HSO → PAF	TRC → PAF	SOC → PAF	PAF → ATL	PAF → WTL	ATL → WTL
(LIM, 2020)	Research: AFE/PAF/ATL/WTL	/	/	/	/	/	/	/
(Judge, 2019)	Research: AFE/PAF/ATL/WTL	/	/			/	/	/
(Sun, 2017)	Research/AFE/PAF/WTL	/	/	/	/		/	
(Lai, 2016)	Research: AFE/PAF/ATL	/	/	/	/	/		
(Tan, 2013)	Research: AFE ATL/WTL	/	/					/
(Tiraphat, 2017)	Research/AFE	/	/	/	/			
(Verana, 2011)	Research/AFE	/	/	/	/			
(Zaman & Thornton, 2018)	Research/Indicators	/	/	/	/			
(Gibney and Shannon, 2017)	Research/Indicators	/	/	/	/			
(Orpana, 2016)	Research/Indicators	/	/	/	/			
(Lawton and Nahemow, 1973)	Theory: PAF/ATL/WTL					/	/	
(Walters, 1974)	Theory: PAF/ATL/WTL					/	/	/
(Palacio-Fierro, 2020)	Theory: PAF/ATL/WTL					/	/	/
(Ajzen, 1991)	Research: PAF/ATL/WTL					/	/	/
(Bu, 2020)	Research: ATL/WTL					/		/
(Zhang, 2018)	Research: ATL/WTL					/		/
(Novek & Menec, 2013)	Research: PAF/ATL					/		
(Emlet and Moceri, 2012)	Research: PAF/ATL					/		
(Lu, 2011)	Research: ATL/WTL							/

Remarks: *AFE is Age-friendly Environment, TPB is Theory of Planned Behavior,
ETA is Ecological Theory of Aging, and TCB is Theory of Consumer Behavior

2.3.2. Conceptual Framework

The study applied the ecological theory of aging to explain the positive relationship between four constructs of the age-friendly environment, and the elderly's perceived age-friendly environment (PAF). Adopting the age-friendly environment concept introduced by WHO, the age-friendly environment constructs were housing indoor (HSI), housing outdoor (HSO), transportation and communication services (TRC), and social participation (SOC). Applying the theory of consumer behavior, the elderly's perception of outcome from living in age-friendly environment and their attitude towards living in age-friendly environment (ATL) were behavioral processes, consequently influencing the elderly's willingness to live in age-friendly environment (WTL), as illustrated by Figure 2.4, the conceptual framework.

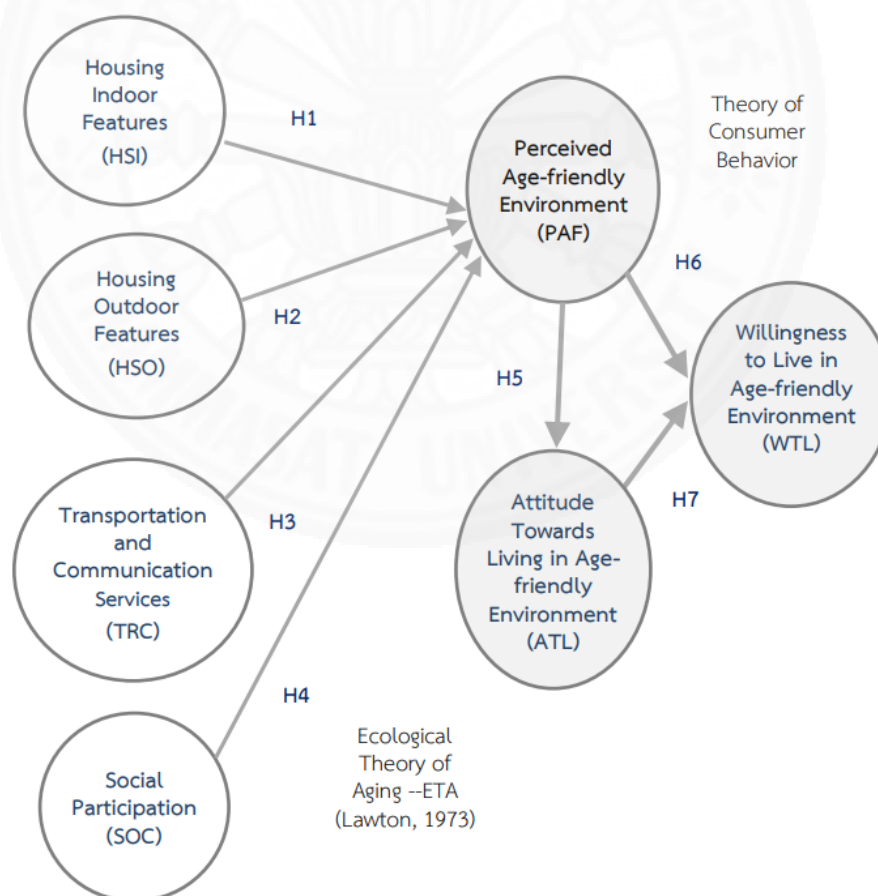


Figure 2.4 The Conceptual Framework

CHAPTER 3

RESEARCH METHODOLOGY

This chapter explains the methodology applied for the research study. The content covers the research approach, the data collection, the research tools, the research constructs and measurement, the data analysis and pretest reliability.

3.1 Research Approach

The research study “Thai Pre-aging Adults’ Willingness to Live in Age-friendly Environment” was a “quantitative research” using structured questionnaires collecting through online outreaches from sample size. To refine and navigate the questionnaire, a pre-test and pilot test have been undertaken to ensure the questionnaire’s quality.

The research applied the partial least square structural equation modelling (PLS-SEM) using SmartPLS3.3.3 software in analyzing the relationships among variables and testing the hypothesis. PLS-SEM operated using a small sample size, normalizes the data, and was suitable for complicated structural models. PLS regression was a statistical method using ordinary least square (OLS) for constructing predictive model parameters by maximizing variance in constructs. Analyses of multiple regression, variables and multiple discrimination were employed for calculating the equation with multiple independent variables. SEM was a technique for statistical analyzing the structural relationships between measured variables and latent constructs, by examining all hypotheses. This method allowed to relax assumptions on data distribution. The analysis and hypothesis testing were conducted by scaling items measurement by using 5-point Likert-type scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

3.1.1. Research Population

The population in this research are 9,692,194 pre-aging adults (50-59 years old) (National Statistical Office, 2020), who are currently living independently with no caregiver assistant.

3.1.2. Sample Size

Suitable sample sizes are important in SEM analysis to support the reliability of parameter estimation, model goodness fit, and statistical analysis (Shah and Goldstein, 2006). For PLS-SEM, it is practical to use the “10 times” rule of thumb for estimating the minimum sample size (Chin, 1998). The rule of thumb in regression analysis suggests there should be at least 10 observations per measured variable. The number of measured variables in the structural model was 39, the applicable sample size for hypothesis testing, therefore, would be 390 observations.

3.2 Data Collection

This research used sampling techniques for data collection. Because of limitations imposed by the Covid-19 pandemic, the data collection was conducted through online questionnaires created via Google Forms. To ensure social distancing, the questionnaire was distributed through online channels such as Facebook, LINE, E-mail, Telegram, Instagram, Direct Message, and other channels convenient for respondents. The period of data collection was 1 - 15 March 2021.

3.3 Research Tools

The research tool for data collection was a questionnaire. Both English and Thai versions of the questionnaire were presented, shown in Appendix C and D. A pre-test of the questionnaire was conducted in 40 random samples with qualified pre-aging adults. The pretest aimed to clarify the questionnaire and to check its suitability for respondents.

The questionnaire is comprised of four sections as follows:

Section 1: Filtering question

The screening question is used to qualify samples to our criteria.

Section 2: Age-friendly Environment (AFE)

In this section, the sample is asked questions on their perception about age-friendly environment: physical housing indoor, physical housing outdoor, transportation and social participation. This section consists of 24 measured variables.

Section 3: Perception, Attitude and Willingness

This section consists of measurement of age-friendly environment constructs, that influence on perceived age-friendly environment, attitude towards living in age-friendly environment and willingness to live in age-friendly environment. This section consists of 15 measured variables.

All 39 measured variables were assessed via a 5- point Likert- Type scale, ranging from 1 ‘Strongly Agree’, 2 ‘Agree’, 3 ‘Neither Agree Nor Disagree’, 4 ‘Disagree’ and 5 ‘Strongly Disagree’. The respondents were asked about their opinion based on their perception about living in aging life, attitude and willingness to live in age-friendly environment

The mean and standard deviation of the questions were analyzed, and the results were converted according to the criteria (Likert, 1932) for rating the average score as an opinion level, as follows:

Strongly Agree	4.21 – 5.00
Agree	3.41 – 4.20
Neither Agree Nor Disagree	2.61 – 3.40
Disagree	1.81 – 2.60
Strongly Disagree	1.00 – 1.80

Section 4: Demographic data

Demographic data in this questionnaire included the sociodemographic and economic data of the respondents. The data included age, gender, marital status, education level, income level, health condition, current residence condition, and tendency of moving to a new home. These data were subsequently analyzed using descriptive statistics, which is shown in Chapter 4.

3.4 Research Constructs and Measurement

The questionnaire is a research tool, measuring each parameter in five scales for evaluating all constructs and testing hypotheses in the structural model. The measurements are established by complying research findings, priority age-friendly indicator studies and conceptual framework from literature reviews. The structural model was designed under the conceptual framework, consisting of seven latent constructs namely, housing indoor, housing outdoor, transportation and communication services, social participation, perceived age-friendly environment, attitude towards living in age-friendly environment and willingness to live in age-friendly environment. Questions for the seven latent constructs and sources for reference are illustrated in Table 3.1 – Table 3.7.

Table 3.1

Measurement of Latent Construct and Sources – HSI

SYM	Housing Indoor (HSI)	(Lucino, 2019)	(Nascimento, 2015)	(Zaman & Thornton, 2018)	(Gibney & Shannon, 2018)	(Orpana, 2016)	(Tiraphat, 2017)
HSI1	House is designed and decorated with mood and tone as the elderly's taste and style to value in terms of psychological health and happiness.	/		/			
HSI2	House is age-suitable size for the elderly to keep good house condition and maintenance	/		/	/		
HSI3	House is well equipped and functioned for independent daily lifestyle of the elderly		/	/		/	/
HSI4	House is age-appropriately designed to support daily life of the elderly, such as physical convenience, comfortable mobility, and accident prevention	/	/				/
HSI5	House is designed with age-security features with feeling of security from threats and/or intruders, such as installed security system		/				/
HSI6	House is designed with age-safety features such as emergency ambulance call system when assistance is needed	/	/				

Table 3.2

Measurement of Latent Construct and Sources – HSO

SYM	Housing Outdoor (HSO)	(Nascimento, 2015)	(Zaman & Thornton, 2018)	(Thepparp and Uemura, 2017)	(Cachadinha, 2012)	(Tiraphat, 2017)
HSO1	Opened green space and shaded trees surrounding your house		/	/		/
HSO2	Clean and well-maintained opened space and building surrounding your house	/	/	/		/
HSO3	Safety and security with communities and neighbors surrounding your house	/	/	/		/
HSO4	Condition surrounding residences support to your health such as low or no noise /odor/air pollution			/		/
HSO5	Existence of accessible recreation and leisure areas such as by walking, cycling, automobile driving		/		/	

Table 3.3

Measurement of Latent Construct and Sources – TRC

SYM	Transportation and Communication Services (TRC)	(Zaman & Thornton, 2018)	(Gibney & Shannon, 2018)	(Thepparp and Uemura, 2017)	(Shen & Perry, 2014)	(Bradley, 2013)	(Tiraphat, 2017)
TRC1	Convenient and safe for family members, relatives, and friends to visit you		/				
TRC2	Convenient access to hospital and medical services	/	/		/		
TRC3	Convenient access to join social and religion activities	/					
TRC4	Convenient access to recreation and leisure places	/					
TRC5	Convenient access to places in daily life, such as markets, retail shops, malls	/	/	/			/
TRC6	Accessible to communication channels as usual			/		/	/
TRC7	Accessible to internet networks as usual			/		/	

Table 3.4

Measurement of Latent Construct and Sources – SOC

SYM	Social Participation (SOC)	(Zaman & Thornton, 2018)	(Gibney & Shannon, 2018)	(Orpana, 2016)	(Emlet & Mocerri, 2013)
SOC1	Capable to interact and participate with family members as usual		/		/
SOC2	Occasionally interact with friends and colleagues as usual	/	/		/
SOC3	Good relationships and respectful interactions with neighbors and community members				/
SOC4	Opportunities for learning to keep up with new knowledge for supporting aging life through offline and online channels	/		/	
SOC5	Opportunities to participate in community activities occasionally			/	/
SOC6	Experience of respect and exchange among inter-generation with no age discrimination		/		/

Table 3.5

Measurement of Latent Construct and Sources – PAF

SYM	Perceived Age-friendly environment (PAF)	(Lucino, 2019)	(Karol, 2004)	(Emlet & Mocerri, 2013)	(Lim, 2020)	(Sun, 2017)	(Practicia, 2019)
PAF1	You think age-friendly environment is reflected by convenient independent living	/	/				
PAF2	You think age-friendly environment is reflected by accessibility to public services	/				/	
PAF3	You think age-friendly environment is reflected by social connectivity			/	/		/
PAF4	You think age-friendly environment is reflected by security in life and property from outside threats and intrusion					/	/
PAF5	You think age-friendly environment is reflected by safety in daily living	/				/	

Table 3.6

Measurement of Latent Construct and Sources – ATL

SYM	Attitude Towards Living in Age-friendly Environment (ATL)	(Tang & Pickard, 2008)	(Burke, 2012)	(Lim, 2020)	(Xie, 2018)	(Lai, 2016)
ATL1	You think you can obtain good quality of life when living in age-friendly environment			/		/
ATL2	You think your health can sustain and improve when living in age-friendly environment			/		/
ATL3	You think you are not isolated and active when living in age-friendly environment		/	/		
ATL4	You think you can achieve life satisfaction when living in age-friendly environment			/	/	
ATL5	You think you can securely live until late life when living in age-friendly environment	/		/		

Table 3.7

Measurement of Latent Construct and Sources – WTL

SYM	Willingness to Live in Age-friendly environment (WTL)	(Lim, 2020)	(Lee 2019)	(Lee & Yoo, 2020)	(Zhang, 2018)
WTL1	You plan to move to live in age friendly environment in the future	/			/
WTL2	You think about your residence with age-friendly environment to live until the end of your life	/			/
WTL3	You intend to live in residences located in age-friendly environment for your aging life	/	/		
WTL4	You plan to buy residence with age-friendly environment to live until the end of your life	/			/
WTL5	If you want to buy or lease residences for aging in place, you tend to pay more to buy or lease residences located in age-friendly environment than normal market residences	/		/	

3.5 Data Analysis

Data from questionnaires were filtered, screened, tested for normality, and sorted for analysis. PLS-SEM simulated the data for hypotheses testing and path coefficient predicting. Data were analyzed in three sections: descriptive statistic, measurement model evaluation, and structural model assessment, as follows:

3.5.1 Descriptive Statistic

Descriptive statistic summarized and described the characteristics of data sets obtained from the questionnaire. Characteristics of measured variables were measured by mean, standard deviation, or frequency. The descriptive statistic gave a fundamental understanding about the collective properties of measured variables. In addition, it also provided an idea about the probability distribution, or the overall “shape” of the data, which could be depicted on a table, a graph, a histogram or etc.

3.5.2 Measurement Model Evaluation

The measurement model evaluation presented relationships between the constructs (or latent variables) and their measured variables in the outer model. The model evaluation included validity and reliability tests of research tools, which are as follows:

3.5.2.1. Outer Loadings

Outer loadings measured indicator reliability and explained the quality of measured variables to indicate its latent constructs. Acceptable measured variables should reflect latent constructs by no less than 50%. Therefore, standardized outer loadings should ideally be equal or more than a suggested value of 0.70 (Hair, 2010). The value 0.70 ensured that such measured variables are qualified as the indicators to explain the variance of the latent constructs. In practical, factor loadings estimates could be lower than 0.7 but must greater than 0.6 (Chin, 1998; Hair, 2006). This study, therefore, set the threshold limit of 0.65. When the outer loadings of a measured variable were less than 0.65, such measured variable should be deleted. It is suggested, in practical, to first delete the lowest outer loadings value.

3.5.2.2. Reliability

Reliability was about the consistency of a measure. Reliability test indicated the accuracy of measurement in determining the variables. For PLS-SEM, composite reliability and Cronbach's alpha values were used for the measurement. Cronbach's alpha could be any value between 0.00 to 1.00, which were interpreted as no reliability (0.00) to high reliability (1.00). The acceptable level of both composite reliability and Cronbach's alpha was 0.7 or more which indicated the reliability of the structured questionnaire (Hair, 2017).

3.5.2.3. Convergent Validity

The convergent validity usually demonstrated the degree that measured variables of a latent construct were correlated and applicable to indicate the latent construct. Convergent validity is measured by "Average Variance Extract" (AVE), which should be greater than 0.5, to reflect that the variance of measured variables could explain the latent construct by higher than 50 percent (Hair, 2016).

3.5.2.4. Discriminant Validity

Discriminant validity in the PLS-SEM model indicated that measured variables used to estimate a latent construct were distinct and uncorrelated with measured variables used to measure another latent construct. The rule was that measured variables should relate more strongly to their determined latent constructs than another. Fornell-Larcker criterion was tested for discriminant validity of the latent constructs as explained in (1), while Cross loadings analyze the scale items, explained in (2), as follows:

(1) Fornell-Larcker Criteria

Fornell-Larcker criterion was a technic using the square root of average variance extract ($\sqrt{AVE}$) of a latent construct to compare with the correlation of latent constructs in the outer model. The result concluded that a measured variable can better explain the variance of its latent construct than the variance of other latent constructs. To ensure discriminate validity of the latent constructs, the $\sqrt{AVE}$ of each latent construct should be greater than the correlation values among the latent construct in the model (Hair, 2017).

(2) Cross Loadings

When a latent construct had more than one significant factor loading, it was called a cross-loading. Cross loadings technique was used for evaluating the degree of which each measured variable can explain each latent construct in the model. Factor loading value for a latent construct greater than 0.707 meant that measured variables could explain their determined latent construct (Hair, 2017).

3.5.3. Structural Model Assessment

Structural model “Inner Model” was assessed by coefficient determinant, hypothesis testing, assessing structural model fit and structural analysis.

3.5.3.1. Coefficient Determinant

The coefficient determinant, R^2 , was a measurement for explaining an influence on relationship of a variable to another related variable. R^2 ranges from 0 to 1.0. R^2 equal to 1.0 indicated a perfect fit, meaning highly reliable model for future forecasts. The value of 0.0 indicated that endogenous variable could not be predicted by exogenous variable in the inner model. R^2 value at 0.75 indicated high level of forecast accuracy, followed by 0.50 (middle level) and 0.25 (low level). In the structural model assessment, R^2 at higher than 0.25 was acceptable (Hair, 2017).

3.5.3.2. Hypothesis Testing

Hypothesis testing was a method to predict path coefficients of inner model and to test for the significance level in each path relationship. Path coefficient ranged from -1 to +1. The coefficient value at +1 implied the strongest positive relationship, while the value at -1 implied the strongest negative relationship. PLS-SEM bootstrapping technique was a non-parametric resampling test. In the bootstrapping process, subsamples were created to estimate a significance level of the path coefficient, by randomly drawing observations from the original set of data. This process repeatedly created large number of random sub-samples, practically about 5,000. The two-tailed hypotheses testing with smaller sample sizes were acceptable (Hair, 2017). The significance level was applied when $p < 0.05$, given $t\text{-value} > 1.96$.

3.5.3.3. Structural Model Fit Assessment

Goodness of fit (GOF) was an index describing how well the structural model suitable fit to the observations, based on a normal distribution of the observation (Maydeu and Garcíá, 2010). The structural model fit should range from 0.10 (small GOF), 0.25 (medium GOF) and 0.36 (large GOF), as presented in Table 3.8. The formula for the GOF calculation is as follows:

$$GOF = \sqrt{(Average(AVE)) * (Average(R^2))}$$

Table 3.8

The Goodness of Fit (GOF) Index

GOF	0.10	0.25	0.36
Evaluation	Small	Medium	Large

Source: Tenenhaus, Amato and Vinzi, 2004

3.5.3.4. Structural Equation Model Analysis

Structural equation model analysis was a technique for analyzing the structural relationships of latent constructs. The technique was to combine factor analysis and multiple regression analysis in analyzing the relationship between measured variables and latent constructs in the structural model. The model estimated how much measured variables directly and indirectly influenced the latent constructs. In the case that the indirect effect was greater than the direct effect, then the mediation effects partially existed. When the direct effect was not significant, then it was called the full mediation (Hair, 2017).

3.6. Pre-test for Reliability and Validity Checking

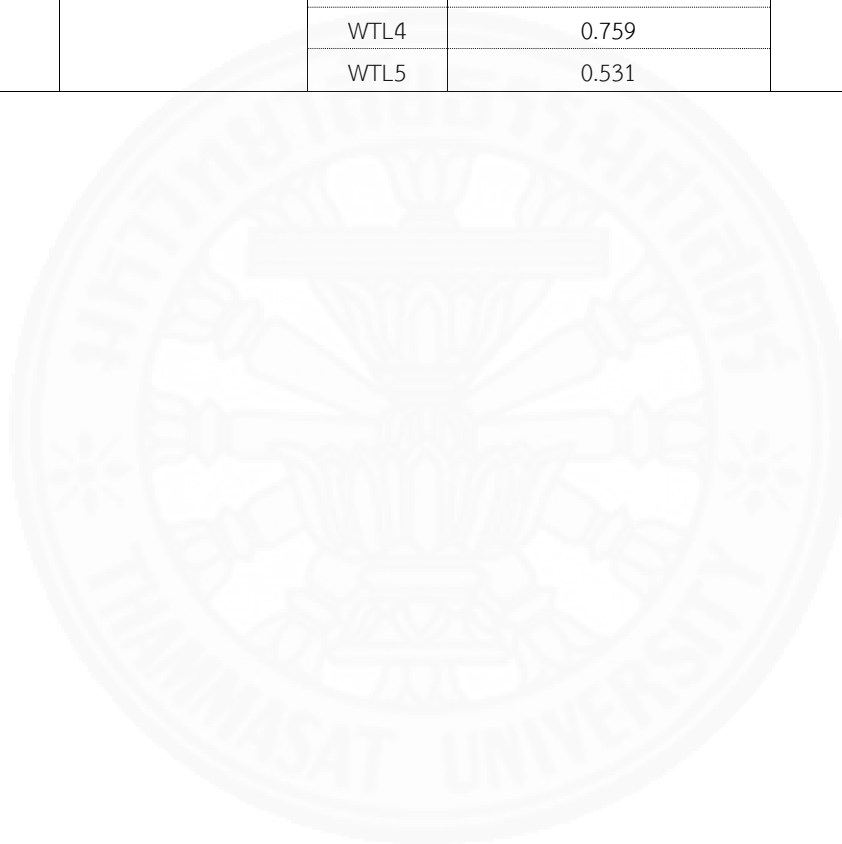
The pretest was conducted with 40 sample questionnaires. In Table 3.9, pretest for reliability and validity checking of all seven latent constructs, HSI, HSO, TRC, SOC, PAF, ATL and WTL had Cronbach's Alpha of 0.832 – 0.943, well above the recommended the Cronbach' s alpha level of at least 0.70 (Nunnally,1978).

Table 3.9

Pretest for Reliability and Validity Check (n=40)

Construct	Number of Items	Items	Total Correlation	Cronbach's Alpha
HSI	6	HSI1	0.539	0.875
		HSI2	0.705	
		HSI3	0.774	
		HSI4	0.858	
		HSI5	0.630	
		HSI6	0.618	
HSO	5	HSO1	0.638	0.832
		HSO2	0.745	
		HSO3	0.691	
		HSO4	0.603	
		HSO5	0.490	
TRC	7	TRC1	0.792	0.914
		TRC2	0.697	
		TRC3	0.809	
		TRC4	0.763	
		TRC5	0.723	
		TRC6	0.730	
		TRC7	0.677	
SOC	6	SOC1	0.805	0.925
		SOC2	0.836	
		SOC3	0.769	
		SOC4	0.706	
		SOC5	0.812	
		SOC6	0.820	
PAF	5	PAF1	0.842	0.890
		PAF2	0.689	
		PAF3	0.755	
		PAF4	0.749	
		PAF5	0.653	

Construct	Number of Items	Items	Total Correlation	Cronbach's Alpha
ATL	5	ATL1	0.815	0.943
		ATL2	0.880	
		ATL3	0.840	
		ATL4	0.866	
		ATL5	0.838	
WTL	5	WTL1	0.650	0.857
		WTL2	0.647	
		WTL3	0.799	
		WTL4	0.759	
		WTL5	0.531	



CHAPTER 4

RESULTS AND DISCUSSION

The objectives of the study were to explain and evaluate (1) how age-friendly environment influences pre-aging adults' perceived age friendly environment, (2) how pre-aging adults' perceived age-friendly environment influences attitude towards living in age-friendly environment, and 3) how pre-aging adults' perceived age-friendly environment and attitude towards living in age-friendly environment influence willingness to live in age-friendly environment. The research was conducted during October 2020 to March 2021, following the step-by-step research methodology as detailed in Chapter 3.

This quantitative research utilized data from questionnaires collected online via Google Form, which were distributed to target respondents, Thai pre-aging adults. Questionnaires returned comprised 479 samples. After filtering by age range of 50-59 years old as pre-aging adults and by independent status with no caretaker assistants, 434 applicable samples remained. The observation data for SEM-PLS analysis was prepared by using IBM SPSS Statistics version 24.0 for checking the data missing and data screening from the applicable 434 samples. Seventy-four outliers were suggested by the SPSS program for cutting off, after running data normality tests and screening by skewness and kurtosis criteria. The sample size qualified for SEM-PLS analysis was 360 samples.

The analysis presented in this Chapter consist of three parts as follows:

- 4.1. Descriptive Statistic Analysis to explain the characteristics and opinions of the questionnaire respondents.
- 4.2. Measurement Model Evaluation (Outer model) to measure and evaluate the relationships between measured variables and seven latent constructs.
- 4.3. Structural Equation Modeling Assessment (Inner model) with Partial Least Square (SEM-PLS) using SmartPLS3.3.3 to explain the relationships of seven latent constructs in the structural model.

4.1 Descriptive Statistic Analysis

Descriptive statistic gave a fundamental understanding about the collective properties of measured variables, which were measured by mean, standard deviation, or frequency. Detailed information was summarized in APPENDIX E.

4.1.1. Sociodemographic Description of Respondents

The descriptive statistics explained socio-demographic characteristics (age, gender, marital status, and education level) and data distribution of pre-aging respondents (50-59 years old), of which 60.60% were 55-59 years old and 39.40% were 50-54 years old.

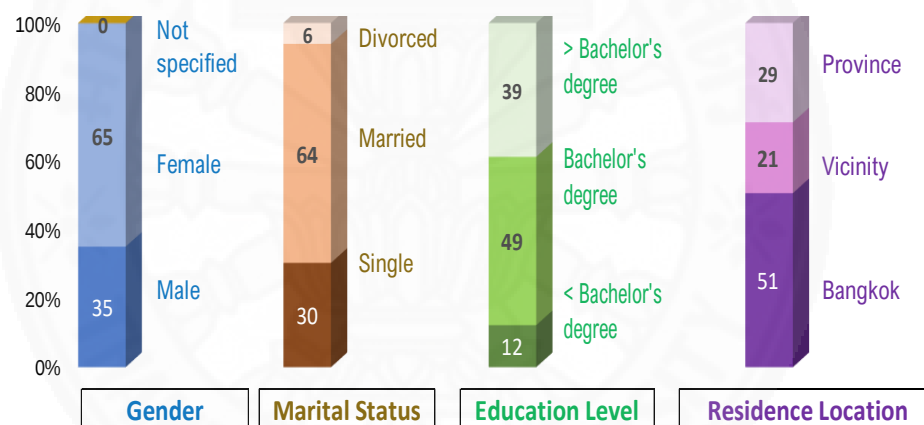


Figure 4.1 General Information of Respondents

Findings from Figure 4.1 revealed the characteristics of pre-aging respondents. In terms of gender, most were Female (64.70%), followed by Male (35.00%) and Not specified (0.30%). In terms of marital status, most were Married (63.60%), followed by Single (30.30%), then Divorced (6.10%). In terms of education level, most were Bachelor level (48.90%), followed by Postgraduate level (38.90%), then Undergraduate level (12.20%). In terms of residence location, most were in Bangkok (50.60%), followed by in Province (28.90%), and in Vicinity (20.50%).

4.1.2 Income Level, Housing and Living Condition of Respondents

The questionnaire included questions on income level, housing and living conditions, which were presented to support the analysis and to better understand the behavior of the respondents.

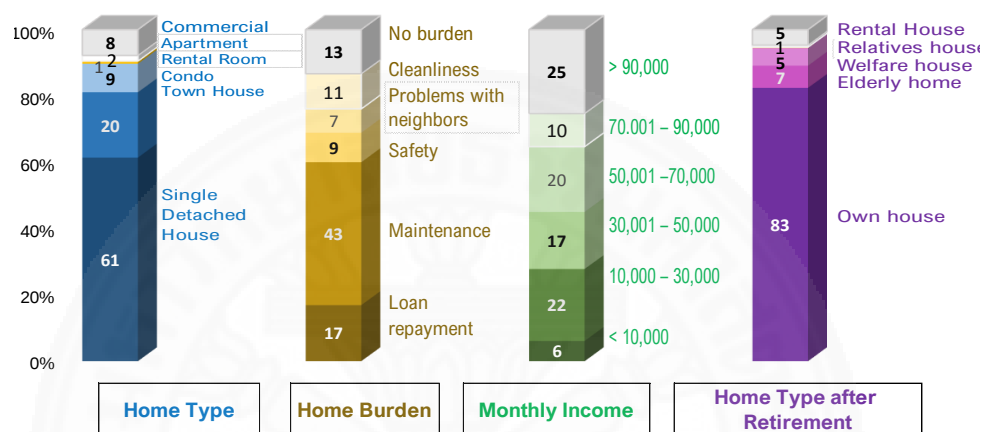


Figure 4.2 Housing Condition and Income Level of Respondents

Findings from Figure 4.2 indicated housing and living conditions and income level of pre-aging respondents. In terms of home type, most responses were Single detached houses (61.40%), followed by Town house (19.70%), Condominium (8.60%), Other (Commercial buildings) (7.80%), Apartment (1.70%), and Rental room (1.70%). In terms of burden of residence, most responses were Maintenance (43.10%), followed by Loan payment (16.90%), then Other (no burden) (13.30%), Sanitary (10.60%), Safety (8.90%), and Neighbors (7.20%). In terms of monthly revenue (baht/month), most respondents were > 90,000 (25.30%), followed by 10,000-30,000 (21.70%), then 50,001-70,000 (19.70%), 30,001-50,000 (17.20%), 70,001-90,000 (10.00%), and < 10,000 (6.10%). In terms of residence after retirement, most were Owned (82.50%), followed by Elderly residence (6.70%), then Relative (5.30%), Other (not yet) (4.70%), Welfare (0.60%), and Rent (0.30%).

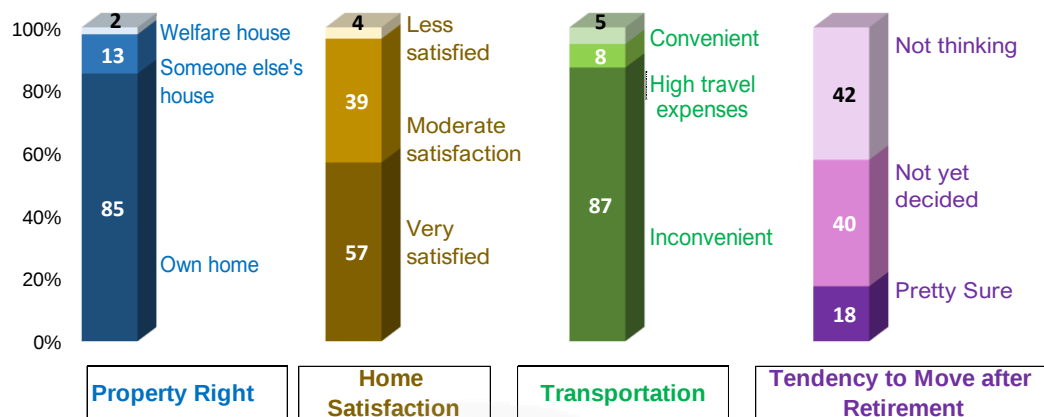


Figure 4.3 Property Right and Home Satisfaction of Respondents

Findings from Figure 4.3 indicated property right and home satisfaction of pre-aging respondents. In terms of current residence, most were owned (85.30%), followed by resident (12.50%), and welfare (2.20%). In terms of residence satisfaction, most were Very satisfied (56.90%), followed by Moderately satisfied (39.40%), and Less satisfied (3.60%). In terms of transportation, most responses were Convenient (87.20%), followed by High cost (7.50%), and Not convenient (5.30%). In terms of tendency to relocate after retirement, most respondents answered Not thinking (42.20%), followed by Not yet decided (40.30%), and Pretty sure (17.50%).

4.1.3. Descriptive Analysis of Mean and Standard Deviation of Constructs

To describe the opinion level of respondents for each indicator obtained from the questionnaire, the analysis of observation means and standard deviation of indicators in each latent construct were presented. The mean and standard deviation were analyzed for each question. Observation mean was compared with the calculated criteria (Likert, 1932) to rate the average score as an opinion level, as follows:

Strongly Agree	4.21 – 5.00
Agree	3.41 – 4.20
Neither Agree Nor Disagree	2.61 – 3.40
Disagree	1.81 – 2.60
Strongly Disagree	1.00 – 1.80

Findings from Table 4.1 revealed the opinions on in housing indoor of pre-aging respondents is Strongly agree ($\bar{X}$ = 4.73). Each indicator of housing indoor found that House is age-appropriately designed to support with elderly daily life of the elderly, such as physical convenience, comfortable mobility, and accident prevention (HSI4), House is designed with age-security features with feeling of security from threats and/or intruders, such as installed security system (HSI5), House is designed with age-safety features such as emergency ambulance call system when need assistance is needed (HSI6), Age-suitable size of house for the elderly to keep good house condition and maintenance (HSI2), House is well equipped for elder independent daily lifestyle of elderly (HSI3), and House is designed and decorated with mood and tone as elderly's desired and taste to value in terms of psychological health and happiness. (HSI1) were Strongly Agree (in order).

Table 4.1

Mean, Standard Deviation and Opinion Level - HSI

		$\bar{X}$	SD	Opinion Level
HSI	Housing Indoor	4.77	0.320	Strongly Agree
HSI1	House is designed and decorated with mood and tone as elderly's desired and taste to value in terms of psychological health and happiness.	4.65	0.564	Strongly Agree
HSI2	House is age-suitable size for the elderly to keep good house condition and maintenance	4.77	0.446	Strongly Agree
HSI3	House is well equipped for independent daily lifestyle of elderly	4.73	0.506	Strongly Agree
HSI4	House is age-appropriately designed to support daily life of the elderly, such as physical convenience, comfortable mobility, and accident prevention	4.87	0.361	Strongly Agree
HSI5	House is designed with age-security features with feeling of security from threats and/or intruders, such as installed security system	4.84	0.376	Strongly Agree
HSI6	House is designed with age-safety features such as emergency ambulance call system when assistance is needed	4.79	0.474	Strongly Agree

Table 4.2

Mean, Standard Deviation and Opinion Level - HSO

		$\bar{X}$	SD	Opinion Level
HSO	Housing Outdoor	4.73	0.344	Strongly Agree
HSO1	Opened green space and shaded trees surrounding your house	4.73	0.519	Strongly Agree
HSO2	Clean and well-maintained opened space and building surrounding your residences	4.83	0.376	Strongly Agree
HSO3	Safety and security with communities and neighbors surrounding houses	4.65	0.563	Strongly Agree
HSO4	Condition surrounding residences support to your health such as low or no noise /odor/air pollution	4.78	0.455	Strongly Agree
HSO5	Existence of accessible recreation and leisure areas such as by walking, cycling, automobile driving	4.66	0.581	Strongly Agree

Findings from Table 4.2 revealed the opinion on housing outdoor of pre-aging respondents is Strongly Agree ($\bar{X}$ = 4.73). Each indicator of housing outdoor found that Clean and well-maintained opened space and buildings surrounding your residences (HSO2), Conditions surrounding residences support to your health such as low or no noise / odor / air pollution (HSO4), Opened green space and shaded trees surrounding your house (HSO1), Existence of accessible reachable recreation and leisure areas such as by walking, bike riding cycling, automobile driving (HSO5), and Safety and security with communities and neighbors surrounding houses (HSO3) were Strongly Agree (in order).

Findings from Table 4.3 revealed the opinion in transportation and communication services of pre-aging respondents is Strongly Agree ($\bar{X}$ = 4.67). Convenient access to hospital and medical services (TRC2), Accessible to internet networks as usual daily life (TRC7), Convenience access to visit places in daily life, such as markets, retail shops, malls (TRC5), Accessible to communication channels as usual daily life (TRC6), Convenience and safety for family members, relatives, and friends to visit you (TRC1), Convenient access to visit recreation and leisure places (TRC4), and Convenient access to join social and religious activities (TRC3) were Strongly Agree (in order).

Table 4.3

Mean, Standard Deviation and Opinion Level - TRC

		$\bar{X}$	SD	Opinion Level
TRC	Transportation and Communication Services	4.67	0.410	Strongly Agree
TRC1	Convenient and safety for family members, relatives, and friends to visit you	4.65	0.553	Strongly Agree
TRC2	Convenient access to hospital and medical services	4.81	0.403	Strongly Agree
TRC3	Convenient access to join social and religious activities	4.56	0.639	Strongly Agree
TRC4	Convenient access to recreation and leisure places	4.62	0.580	Strongly Agree
TRC5	Convenient access to places in daily life, such as markets, retail shops, malls	4.69	0.509	Strongly Agree
TRC6	Accessible to communication channels as usual daily life	4.66	0.536	Strongly Agree
TRC7	Accessible to internet networks as usual daily life	4.70	0.487	Strongly Agree

Table 4.4

Mean, Standard Deviation and Opinion Level - SOC

		$\bar{X}$	SD	Opinion Level
SOC	Social Participation	4.49	0.529	Strongly Agree
SOC1	Capable to interact and interpersonal participate with family members as usual life	4.66	0.531	Strongly Agree
SOC2	Occasionally interact with friends and colleague as usual life	4.51	0.642	Strongly Agree
SOC3	Good relationship and respectful interaction with neighbors and community members	4.56	0.585	Strongly Agree
SOC4	Opportunities for learning to keep up with new knowledge for supporting aging life through offline and online channels	4.56	0.608	Strongly Agree
SOC5	Opportunities to participate in community activities occasionally	4.25	0.776	Strongly Agree
SOC6	Experience of respect and exchange among inter-age with no age discrimination	4.38	0.705	Strongly Agree

Findings from Table 4.4 revealed the opinion in social participation of pre-aging respondents is Strongly Agree ($\bar{X}$ = 4.49). Each indicator of social participation found that Capable to interact and interpersonal participate with family members as usual life (SOC1), Good relationships and respectful interactions with neighbors and community members (SOC3), Opportunities for learning to keep up with new knowledge for supporting aging life through offline and online channels (SOC4), Occasionally interact with friends and colleagues as usual life (SOC2), Experience of respect and exchange among inter-age with no age discrimination (SOC6), and Opportunities to participate in community activities occasionally (SOC5) were Strongly Agree (in order).

Table 4.5

Mean, Standard Deviation and Opinion Level - PAF

		$\bar{X}$	SD	Opinion Level
PAF	Perceived Age-friendly Environment	4.67	0.412	Strongly Agree
PAF1	You perceive age-friendly environment is reflected by comfortable in independent living	4.68	0.520	Strongly Agree
PAF2	You think age-friendly environment is reflected by accessibility to public services	4.75	0.484	Strongly Agree
PAF3	You think age-friendly environment is reflected by social connectivity	4.64	0.545	Strongly Agree
PAF4	You think age-friendly environment is reflected by security in life and property from outside threats	4.48	0.663	Strongly Agree
PAF5	You think age-friendly environment is reflected by safety in daily living	4.78	0.426	Strongly Agree

Findings from Table 4.5 revealed the opinion in perceived age-friendly environment of pre-aging respondents is Strongly Agree ($\bar{X}$ = 4.67). Each indicator of perceived age-friendly environment found that You think age-friendly environment is reflected by safety in daily living (PAF5), You think age-friendly environment is reflected by accessibility to public services (PAF2), You perceive age-friendly environment is reflected by comfortable in independent living (PAF1), You think age-friendly environment is reflected by social connectivity (PAF3), and You think

age-friendly environment is reflected by security in life and property from outside threats (PAF4) were Strongly Agree (in order).

Findings from Table 4.6 revealed the opinion in attitude towards living in age-friendly environment of pre-aging respondents is Strongly Agree ($\bar{X} = 4.65$). Each indicator of attitude towards living in age-friendly environment found that You think you can obtain good quality of aging life when living in age-friendly environment (ATL1), You think your health can sustain and improve when living in age-friendly environment (ATL2), You think you are not isolated and active when living in age-friendly environment (ATL3), You think you can achieve life satisfaction when living in age-friendly environment (ATL4) and You think you can securely live until late life when living in age-friendly environment (ATL5) were Strongly Agree (in order).

Table 4.6

Mean, Standard Deviation and Opinion Level – ATL

		$\bar{X}$	SD	Opinion Level
ATL	Attitude Towards Living in Age-friendly Environment	4.65	0.474	Strongly Agree
ATL1	You think you can obtain good quality of aging life when living in age-friendly environment	4.73	0.491	Strongly Agree
ATL2	You think your health can sustain and improve when living in age-friendly environment	4.69	0.524	Strongly Agree
ATL3	You think you are not isolated and active when living in age-friendly environment	4.58	0.615	Strongly Agree
ATL4	You think you can achieve life satisfaction when living in age-friendly environment	4.57	0.616	Strongly Agree
ATL5	You think you can securely live until late life when living in age-friendly environment	4.66	0.577	Strongly Agree

Findings from Table 4.7 revealed the opinion in willingness to live in age-friendly environment of pre-aging respondents is Strongly Agree ($\bar{X} = 4.49$). Each indicator of willingness to live age-friendly environment found that You plan to move to live in age friendly environment in the future (WTL1), You plan to buy residence with age-friendly environment to live until the end of your life (WTL4), You intend to

live in residences located in age-friendly environment for your aging life (WTL3), You think about your residence with age-friendly environment to live until the end of your life (WTL2) and If you want to buy or lease residences for aging in place, you tend to pay more to buy or lease residences located in age-friendly environment than normal market residences (WTL5) were Strongly Agree (in order).

Table 4.7

Mean, Standard Deviation and Opinion Level - WTL

		$\bar{X}$	SD	Opinion Level
WTL	Willingness to Live in Age-friendly Environment	4.49	0.570	Strongly Agree
WTL1	You plan to move to live in age friendly environment in the future	4.62	0.580	Strongly Agree
WTL2	You think about your residence with age-friendly environment to live until the end of your life	4.43	0.728	Strongly Agree
WTL3	You intend to live in residences located in age-friendly environment for your aging life	4.47	0.727	Strongly Agree
WTL4	You plan to buy residence with age-friendly environment to live until the end of your life	4.53	0.675	Strongly Agree
WTL5	If you want to buy or lease residences for aging in place, you tend to pay more to buy or lease residences located in age-friendly environment than normal market residences	4.38	0.770	Strongly Agree

4.2 Measurement Model Evaluation (Outer Model)

In the study's conceptual framework, the measurement model comprised seven latent constructs; housing indoor (HSI), housing outdoor (HSO), transportation and communication services (TRC), social participation (SOC), perceived age-friendly environment (PAF), attitude towards living in age-friendly environment (ATL) and willingness to live in age-friendly environment (WTL). The seven latent constructs were assessed by a total of 39 measured variables.

The structural model in SmartPLS3.3.3 software was illustrated in Figure 4.4. Latent constructs were displayed in the ovals, while measured variables were presented in the rectangles for each latent construct.

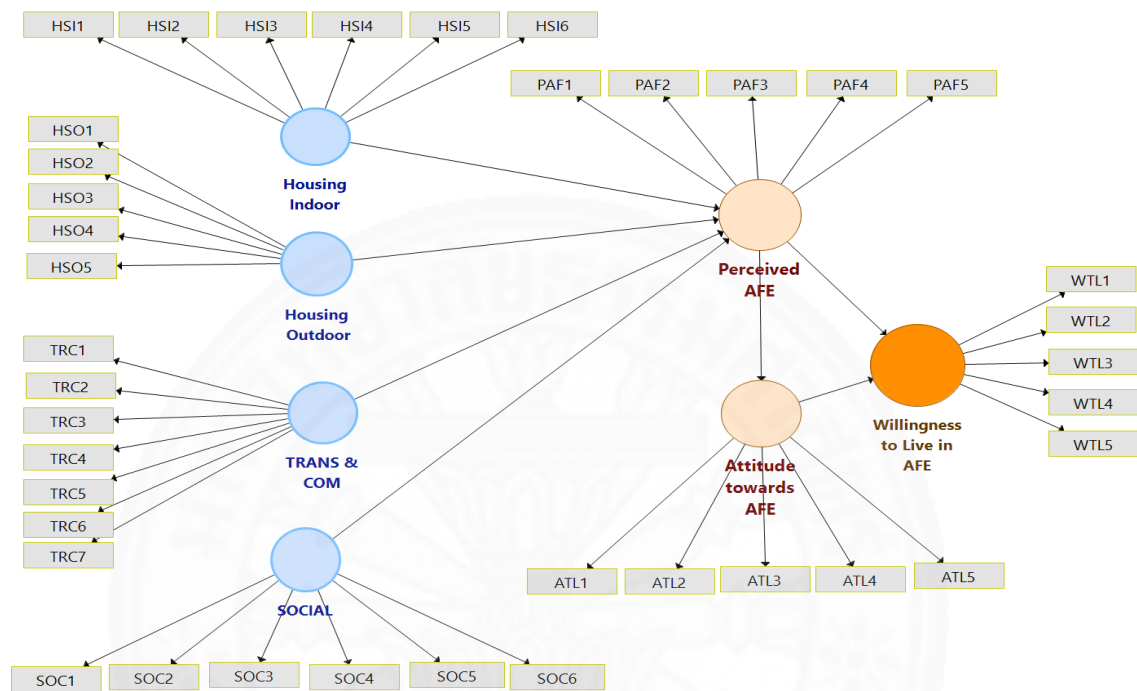


Figure 4.4 The Conceptual Framework in SmartPLS3.3.3

4.2.1. Measured Variables

The measurement of measured variables was reflected by indicators, as shown in Table 4.8. The items HSI4, HSI5, HSI6, HSO1, HSO4 and WTL4 show values of both skewness and excess kurtosis were greater than the acceptable criteria. In the process of data screening, outlier cutoff had been suggested by the SPSS program, to normalize the distribution of observations. These indicators were related to the age-appropriate design of houses, which several studies supported for their significant influencing roles on attitude and willingness to live in age-friendly environment (Lim, 2020; Nascimento, 2015; Nieboer and Cramm, 2017; Sun, 2018). Obtaining them in measurement model analysis in SmartPLS3.3.3 might reveal different implications. Therefore, these indicators were included for the measurement model analysis.

Table 4.8

Basic statistics of Indicators

Variables	Symbol	Mean	Median	Min	Max	Standard Deviation	Excess Kurtosis	Skewness	Number of Observations
Housing Indoor (HSI)	HSI1	4.647	5.000	3	5	0.563	0.847	-1.348	360
	HSI2	4.772	5.000	3	5	0.445	1.749	-1.677	360
	HSI3	4.725	5.000	3	5	0.505	1.826	-1.643	360
	HSI4	4.869	5.000	3	5	0.361	6.975	-2.723	360
	HSI5	4.839	5.000	3	5	0.375	2.576	-2.009	360
Housing Outdoor (HSO)	HSO1	4.731	5.000	3	5	0.519	2.355	-1.792	360
	HSO2	4.831	5.000	4	5	0.375	1.138	-1.770	360
	HSO3	4.650	5.000	3	5	0.562	0.890	-1.363	360
	HSO4	4.778	5.000	3	5	0.454	2.641	-1.864	360
	HSO5	4.656	5.000	2	5	0.580	1.866	-1.568	360
Transportation and Communication Services (TRC)	TRC1	4.650	5.000	3	5	0.553	0.752	-1.309	360
	TRC2	4.806	5.000	3	5	0.403	1.223	-1.678	360
	TRC3	4.558	5.000	3	5	0.639	0.187	-1.152	360
	TRC4	4.622	5.000	3	5	0.579	0.602	-1.264	360
	TRC5	4.689	5.000	3	5	0.509	0.723	-1.318	360
	TRC6	4.656	5.000	3	5	0.536	0.566	-1.244	360
	TRC7	4.703	5.000	3	5	0.486	0.380	-1.250	360
Social Participation (SOC)	SOC1	4.656	5.000	3	5	0.530	0.454	-1.208	360
	SOC2	4.511	5.000	3	5	0.641	-0.166	-0.963	360
	SOC3	4.561	5.000	3	5	0.584	-0.080	-0.955	360
	SOC4	4.561	5.000	3	5	0.607	0.092	-1.059	360
	SOC5	4.253	4.000	2	5	0.775	-1.051	-0.508	360
	SOC6	4.378	5.000	2	5	0.704	-0.502	-0.733	360
Perceived Age- friendly Environment (PAF)	PAF1	4.675	5.000	3	5	0.519	0.632	-1.279	360
	PAF2	4.747	5.000	3	5	0.483	2.100	-1.720	360
	PAF3	4.642	5.000	3	5	0.545	0.464	-1.203	360
	PAF4	4.478	5.000	3	5	0.662	-0.333	-0.898	360
	PAF5	4.783	5.000	3	5	0.425	1.171	-1.597	360
Attitude Towards Living in AFE (ATL)	ATL1	4.733	5.000	3	5	0.490	1.705	-1.615	360
	ATL2	4.694	5.000	3	5	0.523	1.252	-1.475	360
	ATL3	4.575	5.000	3	5	0.615	0.266	-1.154	360
	ATL4	4.569	5.000	3	5	0.615	0.213	-1.129	360
	ATL5	4.656	5.000	3	5	0.556	0.912	-1.368	360
Willingness to Live in AFE (WTL)	WTL1	4.619	5.000	3	5	0.579	0.567	-1.250	360
	WTL2	4.428	5.000	2	5	0.727	-0.403	-0.902	360
	WTL3	4.467	5.000	2	5	0.726	0.019	-1.066	360
	WTL4	4.531	5.000	1	5	0.674	3.346	-1.558	360
	WTL5	4.381	5.000	1	5	0.769	1.021	-1.103	360

4.2.2 Outer Loadings

Outer loadings were reflective indicators, measuring reliability and explaining the quality of measured variables to indicate latent variability. This study set the threshold limit of the acceptable standard value at no less than 0.65. For the first iteration, there was only one indicator, HSI6, revealing the loading value at 0.625, which was lower than the threshold limit, as shown in Table 4.9. In practice, the lowest outer loading value, HSI6 was deleted from the total of 39 items. The deletion of HSI6 resulted in improving the average variance extract (AVE) of HSI from 0.494 to be higher than an applicable value of 0.5.

4.2.3. Construct Reliability

Reliability test indicated the accuracy of measurement in determining the latent constructs, making the latent constructs reliable for assessing a structural equation model. For PLS- SEM, construct reliability test was preferred composite reliability and Cronbach's Alpha at no less than 0.70 (Hair, Sarstedt, Ringle & Gudergan, 2018). As presented in Table 4.9, both composite reliability and Cronbach's Alpha for all latent constructs in the structural model were higher than a threshold value of 0.7. The results meant all latent constructs were accurately measured by the measured variables, and reliable for the structural model.

4.2.4 Convergent Validity

The convergent validity measured the degree that measured variables of a latent construct were correlated and valid to indicate the latent construct. This parameter was measured by AVE. The first iteration presented in Table 4.9, AVE of all latent constructs, except HSI and HSO, were more than 0.50. HSI6 were deleted from the model because the indicator had outer loading (= 0.625) lower than 0.65. After deleting HSI6, the final iteration revealed AVE for HSI improved to 0.525 from 0.494, while EVE for HSO was still lower than 0.5. In conclusion, latent constructs had convergently validity, which meant they were acceptable to explain the variance of measured variables.

Table 4.11

Measurement Model Evaluation

Variables	Indicators	First Iteration				Final Iteration			
		Factor Loading	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)	Factor Loading	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
Housing Indoor	HSI1	0.667	0.797	0.853	0.494	0.682	0.775	0.846	0.525
	HSI2	0.750				0.794			
	HSI3	0.794				0.790			
	HSI4	0.696				0.687			
	HSI5	0.671				0.657			
	HSI6	0.625				Deleted			
Housing Outdoor	HSO1	0.663	0.720	0.817	0.472	0.663	0.720	0.817	0.472
	HSO2	0.712				0.712			
	HSO3	0.703				0.703			
	HSO4	0.655				0.655			
	HSO5	0.699				0.699			
Transportation and Communication	TRC1	0.804	0.885	0.911	0.594	0.804	0.885	0.911	0.594
	TRC2	0.735				0.735			
	TRC3	0.797				0.797			
	TRC4	0.851				0.851			
	TRC5	0.754				0.754			
	TRC6	0.744				0.744			
	TRC7	0.698				0.698			
Social Participation	SOC1	0.795	0.904	0.926	0.675	0.795	0.904	0.926	0.675
	SOC2	0.853				0.853			
	SOC3	0.802				0.802			
	SOC4	0.807				0.807			
	SOC5	0.841				0.841			
	SOC6	0.830				0.830			
Perceived AFE*	PAF1	0.733	0.838	0.885	0.607	0.734	0.838	0.885	0.607
	PAF2	0.777				0.778			
	PAF3	0.830				0.830			
	PAF4	0.790				0.789			
	PAF5	0.761				0.761			
Attitude towards Living in AFE*	ATL1	0.805	0.899	0.925	0.713	0.805	0.899	0.925	0.713
	ATL2	0.866				0.866			
	ATL3	0.830				0.830			
	ATL4	0.865				0.865			
	ATL5	0.854				0.854			
Willingness to Live in AFE*	WTL1	0.792	0.876	0.909	0.668	0.792	0.876	0.909	0.668
	WTL2	0.864				0.864			
	WTL3	0.880				0.880			
	WTL4	0.822				0.822			
	WTL5	0.719				0.719			

Notes: Criteria for; Factor Loading ≥ 0.65 ; Cronbach's Alpha ≥ 0.7 ; Composite Reliability ≥ 0.7 , and AVE ≥ 0.5 .

Remark: * Age-friendly Environment

4.2.5 Discriminant Validity

Discriminant validity indicated that measured variables of a latent construct are distinct and uncorrelated with measured variables used to measure another latent construct. Fornell- Larcker criterion tested for discriminant validity of latent constructs, while cross loadings analyzed the scale items. Results from final iteration were applicable.

4.2.5.1 Fornell-Larcker Criterion

Fornell-Larcker Criterion was measured by the square root of AVE ($\sqrt{AVE}$) of all latent constructs in the structural model. In Table 4.10, $\sqrt{AVE}$ of all latent constructs, except housing outdoor variables, were larger than 0.70, implying that these latent constructs were discriminately valid. In the case that $\sqrt{AVE}$ was lower than 0.7, it could be acceptable when composite reliability was greater than 0.7. Housing outdoor, was the case that its $\sqrt{AVE}$ value was lower than 0.7, as AVE was allowed for lower than 0.5.

Table 4.10

Discriminant Validity: Fornell-Larcker Criterion

Latent Constructs	Attitude towards AFE	Housing Indoor	Housing Outdoor	Perceived AFE	SOCIAL	TRANS & COM	Willingness to Live in AFE
Attitude towards AFE	0.844						
Housing Indoor	0.490	0.725					
Housing Outdoor	0.469	0.585	0.687				
Perceived AFE	0.704	0.609	0.582	0.779			
SOCIAL	0.601	0.523	0.615	0.726	0.822		
TRANS & COM	0.600	0.557	0.676	0.704	0.775	0.770	
Willingness to Live in AFE	0.687	0.368	0.407	0.546	0.533	0.495	0.817

4.2.5.2. Cross Loadings

To evaluate discriminant validity, cross loadings indicated the degree of which each measured variable could explain each latent construct in the model. Factor loading value for a latent construct greater than 0.65 was applied in this study as explained in Topic 3.5.2.1. In Table 4.11, factor loadings of each measured variable revealed more than 0.65, thus, measured variables were discriminately valid.

Table 4.11

Cross Loadings

Measured Variables	Attitude towards AFE	Housing Indoor	Housing Outdoor	Perceived AFE	SOCIAL	TRANS & COM	Willingness to Live in AFE
ATL1	0.805	0.460	0.463	0.619	0.520	0.549	0.529
ATL2	0.866	0.439	0.452	0.625	0.501	0.554	0.561
ATL3	0.830	0.371	0.340	0.538	0.457	0.461	0.565
ATL4	0.865	0.419	0.343	0.624	0.541	0.496	0.617
ATL5	0.854	0.378	0.382	0.562	0.516	0.474	0.625
HSI1	0.396	0.682	0.478	0.479	0.449	0.443	0.300
HSI2	0.448	0.794	0.410	0.542	0.438	0.456	0.326
HSI3	0.356	0.790	0.414	0.429	0.374	0.415	0.238
HSI4	0.226	0.687	0.351	0.286	0.251	0.282	0.149
HSI5	0.281	0.657	0.451	0.397	0.325	0.371	0.267
HSO1	0.319	0.359	0.663	0.394	0.442	0.446	0.306
HSO2	0.362	0.484	0.712	0.423	0.387	0.474	0.295
HSO3	0.297	0.387	0.703	0.419	0.452	0.473	0.291
HSO4	0.295	0.385	0.655	0.372	0.352	0.374	0.237
HSO5	0.336	0.388	0.699	0.386	0.480	0.553	0.263
PAF1	0.448	0.462	0.461	0.734	0.548	0.511	0.392
PAF2	0.550	0.504	0.376	0.778	0.480	0.459	0.403
PAF3	0.608	0.509	0.463	0.830	0.564	0.604	0.433
PAF4	0.587	0.426	0.497	0.789	0.690	0.591	0.480
PAF5	0.534	0.479	0.464	0.761	0.530	0.564	0.410
SOC1	0.523	0.439	0.477	0.605	0.795	0.678	0.465
SOC2	0.525	0.454	0.507	0.614	0.853	0.672	0.440
SOC3	0.479	0.423	0.522	0.583	0.802	0.615	0.385
SOC4	0.461	0.438	0.499	0.607	0.807	0.624	0.440
SOC5	0.489	0.418	0.520	0.579	0.841	0.620	0.431
SOC6	0.485	0.407	0.509	0.588	0.830	0.606	0.466
TRC1	0.503	0.435	0.590	0.567	0.640	0.804	0.387
TRC2	0.427	0.432	0.473	0.537	0.511	0.735	0.379
TRC3	0.475	0.436	0.511	0.560	0.655	0.797	0.377
TRC4	0.530	0.463	0.596	0.603	0.654	0.851	0.449
TRC5	0.442	0.393	0.535	0.515	0.574	0.754	0.358
TRC6	0.390	0.477	0.472	0.507	0.564	0.744	0.285
TRC7	0.459	0.363	0.461	0.498	0.572	0.698	0.430
WTL1	0.709	0.355	0.393	0.511	0.487	0.498	0.792
WTL2	0.538	0.259	0.293	0.455	0.445	0.356	0.864
WTL3	0.564	0.277	0.356	0.473	0.463	0.390	0.880
WTL4	0.498	0.297	0.311	0.400	0.403	0.404	0.822
WTL5	0.426	0.301	0.278	0.351	0.347	0.338	0.719

4.2.6 Goodness of Fit

Overall fit of measurement was measured by Goodness of fit index (GOF), which indicated the reliability of the measurement model. The calculation shown in Table 4.12 presented the GOF value of 0.5674, greater than the criteria of 0.1 and higher than 0.36, which indicated the high level of well fit of the overall model (Wetzels, 2009).

Table 4.12

Goodness of Fit

Variables	AVE	R Square
Attitude on AFE	0.7131	0.4937
Housing Indoor	0.5250	
Housing Outdoor	0.4717	
Perceived AFE	0.6067	0.6192
SOCIAL	0.6751	
TRANS & COM	0.5936	
Willingness to Live in AFE	0.6681	0.4767
Average Value	0.6076	0.5298
Goodness of Fit*	0.5674	

Remark: *Goodness of Fit = SQRT ((Average AVE) x (Average R Square))

4.3 Structural Equation Modeling Assessment (Inner Model)

After assessing model measurement evaluation in Topic 4.2, the research measurements both latent constructs and measured variables (the outer model) had reliability and validity for further assessment. The structural equation model (the Inner model evaluation) was assessed with Partial Least Square or SEM-PLS using SmartPLS 3.3.3 to explain the relationships among seven latent constructs in the structural model. Testing the hypothesis in the structural model provided following results: path coefficient, significant level of the hypothesis and reliability of the structural model.

4.3.1 Coefficient Determinant

For structural model evaluation, the conceptual model in this study consists of three endogenous variables: perceived age-friendly environment, attitude

towards living in age-friendly environment and willingness to live in age-friendly environment. In evaluating the influence of exogenous variables on the variance of endogenous variables, the R^2 value should be higher than 0.25 (Chaweanghong, 2015).

In Figure 4.5, the path coefficients, R^2 were stated in the middle of the ovals. The ovals represent the endogenous constructs in SmartPLS3.3.3. The R^2 values were 0.623, 0.495 and 0.480 for perceived age-friendly environment, attitude towards living in age-friendly environment and willingness to live in age-friendly environment, respectively. All R^2 were above 0.25 confirming the validity of the models.

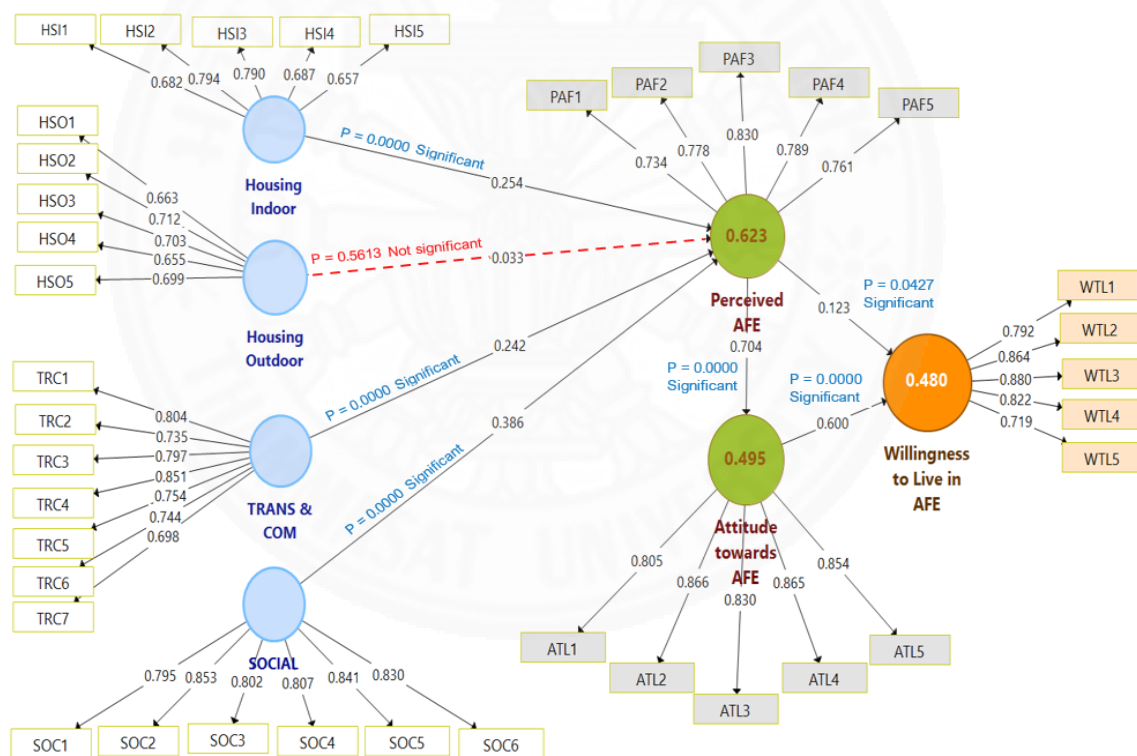


Figure 4.5 The Path Coefficient of Structural Model

The three R^2 values could be implied as follows; (1) Housing indoor (HSI), housing outdoor (HSO), transportation and communication services (TRC) and social participation (SOC) could explain the variance in perceived age-friendly environment by 62.3%; (2) Perceived age-friendly environment could explain the variance of attitude

towards living in age-friendly environment by 49.5%; and (3) Perceived age-friendly environment and attitude towards living in age-friendly environment both could explain the variance of willingness to live in age-friendly environment by 48.0%.

4.3.2 Hypothesis Testing

Using PLS algorithm, the path coefficients and the measurement model evaluation were computed. All the hypothesis testing yielded the positive relationship of each pair relationship according to the hypothesis. Except H2 that was not supported by the t-value and the p-value, making rejection for the hypothesis testing.

Results of the hypothesis H1, H2, H3 and H4 were tested for the positive relationship of the four attributes of age-friendly environment on perceived age-friendly environment, as shown in Figure 4.5 and Table 4.13 explained as follows:

Table 4.13

Results of Hypothesis Testing

Hypothesis	Path Relationship	Path Coefficient	Sample Mean	Standard Deviation	T Statistics	P Values ¹	Test Results
H1	Housing Indoor -> Perceived AFE	0.2536 **	0.2548	0.0493	5.1404	0.0000	Accepted
H2	Housing Outdoor -> Perceived AFE	0.0327 ns	0.0364	0.0564	0.5809	0.5613	Rejected
H3	TRANS & COM -> Perceived AFE	0.2416 **	0.2397	0.0725	3.3329	0.0009	Accepted
H4	SOCIAL -> Perceived AFE	0.3856 **	0.3844	0.0645	5.9774	0.0000	Accepted
H5	Perceived AFE -> Willingness to Live in AFE	0.1233 *	0.1213	0.0608	2.0267	0.0427	Accepted
H6	Perceived AFE -> Attitude on AFE	0.7036 **	0.7047	0.0350	20.1146	0.0000	Accepted
H7	Attitude on AFE -> Willingness to Live in AFE	0.6002 **	0.6042	0.0559	10.7439	0.0000	Accepted

¹ Accepted hypothesis when $p < 0.05$.

*Accepted level when $p < 0.05$, **Accepted when $p < 0.001$, ns= not statistically significant

Hypothesis 1:

The path coefficient of housing indoor to perceived age-friendly environment was 0.2536, with t-statistic at 5.1404 and p-value at 0.0000. Hypothesis 1 was accepted, which meant Housing Indoor is positively related to perceived age-friendly environment.

Hypothesis 2:

The path coefficient of housing outdoor to perceived age-friendly environment was 0.0327, with t-statistic at 0.5809 and p-value at 0.5613, which were not acceptable level. Hypothesis 2 was rejected, which means housing outdoor was not related to perceived age-friendly environment.

Hypothesis 3:

The path coefficient of transportation and communication services to perceived age-friendly environment was 0.2416, with t-statistic at 3.3656 and p-value at 0.0008. Hypothesis 3 was accepted, which means transportation and communication services were positively related to perceived age-friendly environment.

Hypothesis 4:

The path coefficient of social participation to perceived age-friendly environment was 0.3856, with t-statistic at 6.286 and p-value at 0.0000. Hypothesis 4 is accepted, which meant social participation was positively related to perceived age-friendly environment.

Result of hypothesis H5, H6 and H7 represents the test result for the positive relationship of exogenous and endogenous variables. The relationship of perceived age-friendly environment and attitude towards living in age-friendly environment and willingness to live in age-friendly environment are shown in Table 4.15 and can be explained as follows:

Hypothesis 5:

The path coefficient of perceived age-friendly environment to attitude towards living in age-friendly environment is 0.1233, with t-statistic at 2.0200 and p-value at 0.0438. Hypothesis 5 is accepted, which means perceived age-friendly environment is positively related to willingness to live in age-friendly environment.

Hypothesis 6:

The path coefficient of perceived age-friendly environment to willingness to live in age-friendly environment is 0.7036, with t-statistic at 19.9787 and p-value at 0.0000.

Hypothesis 6 is accepted, which means perceived age-friendly environment is related to attitude towards living in age-friendly environment.

Hypothesis 7:

The path coefficient of attitude towards living in age-friendly environment to willingness to live in age-friendly environment is 0.6002, with t-statistic at 10.3281 and p-value at 0.0000. Hypothesis 4 is accepted, meaning that attitude towards living in age-friendly environment is positively related to willingness to live in age-friendly environment.

4.3.3 Interpretation of Empirical Findings

From the hypothesis testing, we can conclude that age-friendly environment variables, that are significant in explaining positive relationships with perceived age-friendly environment, are housing indoor, transportation and communication services and social participation (Lai, 2016). Social participation had a strongest influence on perceived age-friendly environment, as it generated the highest coefficient of 0.3924, compared with the other three variables. This study confirmed the strong influence of social participation on perceived age-friendly environment, in concurrence with several studies (Burke, 2012; Emlet and Moceri, 2012; Orpana, 2016; Zaman & Thornton, 2018; Gibney and Shannon, 2018; and Patricia, 2019).

The hypothesis test for relationship between housing outdoor and perceived age-friendly environment is rejected, indicating this variable is not related significantly to determine perceived age-friendly environment. Many studies supported that housing outdoor was the priority variable for perceived age-friendly environment (Orpana, 2016; Sun, 2018; Zaman & Thornton, 2018; Gibney and Shannon, 2018; Lim, 2020), but this study did not support the hypothesis.

Housing indoor was a significant variable to influence perceived age-friendly environment (Judge, 2019; Tan, 2013). This study confirmed the relationship of housing indoor on perceived age-friendly environment. Interestingly, HSI and HSO were the variables that were not qualified for normality test in the process of measurement screening, as presented in Topic 4.2, with higher-than-acceptable scores

for skewness and kurtosis test. After running path relationship including both variables, HSI became significantly accepted, while HSO was rejected as expected.

4.3.4 Structural Interpretation

SEM- PLS comprehensively analyzes the structural model, providing direct, indirect, and total effects of the exogenous variables on the endogenous variables. In Table 4.16, social participation has the greatest total effect on perceived age-friendly environment, followed by housing indoor, and transportation and communication services.

The study explored the positive relationships of age-friendly variables with perceived age-friendly environment and attitude towards living in age-friendly environment. The results evidenced the relationship according to Lawton's ecological theory for aging, which explains that social and physical environments have a positive influence on attitude towards living in age-friendly environment.

Notably, the study explored two paths of relationship, as reflected in the indirect effect in Table 4.16. The relationship testing results suggested indirect effects of three age-friendly variables, housing indoor, transportation and communication services and social participation to attitude on living in age-friendly environment. In addition, the results reported indirect effects of two age-friendly variables, transportation and communication services and social participation on willingness to live in age-friendly environment. The results might suggest that both relationship paths can be modified for further study.

The empirical findings found attitude towards living in age-friendly environment played a mediating role, as explained by greater indirect effect than direct effect of perceived age-friendly environment to willingness to live in age-friendly environment. The mediating role of attitude towards living in age-friendly environment yielded from this study was in accordance with the results in literature reviews (Lai, 2016; Judge, 2019; Lim 2020).

The study found perceived age-friendly environment influenced directly and indirectly to willingness to live in age-friendly environment, and attitude towards living in age-friendly environment was a partial mediator for the relationship. From Table 4.14, perceived age-friendly environment had a strong influence (0.7036) on attitude towards living in age-friendly environment. The direct effect of attitude towards living in age-friendly environment on willingness to live in age-friendly environment (0.6002) was slightly stronger than the total effect of perceived age-friendly environment on willingness to live in age-friendly environment through attitude towards living in age-friendly environment (0.5456). In Figure 4.6, total indirect effect of perceived age-friendly environment to willingness to live in age-friendly environment (0.4223) was greater than the direct effect (0.1233).

Table 4.14

Total Effects

Relationship	Direct Effect	Indirect Effect	Total Effect
Housing Indoor -> Attitude on AFE	-	0.1784 **	0.1784 **
Housing Indoor -> Perceived AFE	0.2536 **	-	0.2536 **
Housing Indoor -> Willingness to Live in AFE	-	0.1384 **	0.1384 **
Housing Outdoor -> Attitude on AFE	-	0.0230 ns	0.0230 ns
Housing Outdoor -> Perceived AFE	0.0327 ns	-	0.0327 ns
Housing Outdoor -> Willingness to Live in AFE	-	0.0179 ns	0.0179 ns
TRANS & COM -> Attitude on AFE	-	0.1700 **	0.1700 **
TRANS & COM -> Perceived AFE	0.2416 **	-	0.2416 **
TRANS & COM -> Willingness to Live in AFE	-	0.1318 **	0.1318 **
SOCIAL -> Attitude on AFE	-	0.2713 **	0.2713 **
SOCIAL -> Perceived AFE	0.3856 **	-	0.3856 **
SOCIAL -> Willingness to Live in AFE	-	0.2104 **	0.2104 **
Perceived AFE -> Attitude on AFE	0.7036 **		0.7036 **
Perceived AFE -> Willingness to Live in AFE	0.1233 *	0.4223 **	0.5456 **
Attitude on AFE -> Willingness to Live in AFE	0.6002 **		0.6002 **

Note: ** $p < 0.01$, * $p < 0.05$, ns = not statistically significant

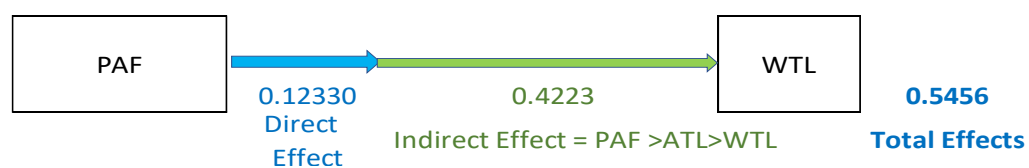


Figure 4.6 Direct and Indirect Effect of PAF on WTL

To support above interpretation, Table 4.15 revealed the specific indirect effects of perceived age-friendly environment to attitude towards living in age friendly environment and of attitude towards living in age friendly environment to willingness to live in age-friendly environment. The specific indirect effect of these relationship is markedly high at 0.4223. This might be implied that influence of perceived age-friendly environment on willingness to live in age-friendly environment was mainly driven by attitude towards living in age-friendly environment, as a partial mediator.

Table 4.15
Specific Indirect Effects

Specific Relationship	Specific Indirect Effects
Housing Indoor -> Perceived AFE -> Attitude towards AFE	0.1784 **
Housing Indoor -> Perceived AFE -> Attitude towards AFE -> Willingness to Live in AFE	0.1071 **
Housing Indoor -> Perceived AFE -> Willingness to Live in AFE	0.0313 ns
Housing Outdoor -> Perceived AFE -> Attitude towards AFE	0.0230 ns
Housing Outdoor -> Perceived AFE -> Attitude towards AFE -> Willingness to Live in AFE	0.0138 ns
Housing Outdoor -> Perceived AFE -> Willingness to Live in AFE	0.0040 ns
TRANS & COM -> Perceived AFE -> Attitude towards AFE	0.1700 **
TRANS & COM -> Perceived AFE -> Attitude towards AFE -> Willingness to Live in AFE	0.1020 **
TRANS & COM -> Perceived AFE -> Willingness to Live in AFE	0.0298 ns
SOCIAL -> Perceived AFE -> Attitude towards AFE	0.2713 **
SOCIAL -> Perceived AFE -> Attitude towards AFE -> Willingness to Live in AFE	0.1628 **
SOCIAL -> Perceived AFE -> Willingness to Live in AFE	0.0475 ns
Perceived AFE -> Attitude towards AFE -> Willingness to Live in AFE	0.4223 **

Note: ** $p < 0.01$, * $p < 0.05$, ns= not statistically significant

The specific indirect effects in Table 4.17 provided empirical results to support the consumer behavior process when housing indoor, transportation and communication services and social participation significantly influenced on willingness to live in age-friendly environment through perceived age-friendly environment, and then through attitude towards living in age-friendly environment. The specific indirect effects of the three age-friendly variables to willingness to live in age-friendly environment were 0.1071, 0.1020 and 0.1628, respectively.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

The Study “Thai Pre-aging Adults’ Willingness to Live in Age-friendly Environment” was a “quantitative research” using data from the structured questionnaires collected during 1-15 March 2021, through online outreaches, from 479 respondents who are pre-aging adults in Thailand. The applicable sample size was 360 samples. The research applied structural equation modeling with partial least square (PLS-SEM) using SmartPLS3.3.3 software in analyzing the relationships among variables and testing the hypotheses. Measurement model evaluation was assessed to verify the validity and reliability of the research tools, before applying to structural model assessment, as detailed in Chapter 3. Study results were presented in descriptive statistical analysis, measurement model evaluation and structural model assessment, as described in Chapter 4.

This chapter presented a comprehensive conclusion from the evaluation, discussion of the theoretical and practical implications, recommendations, and limitations of the study, and suggestions for further research.

5.1. Conclusion

The aging population will account for a major proportion of Thailand’s population in the next decade, representing 23% of the total Thai population. Current pre-aging adults will migrate to the aging population in coming years, accounting for around 55% of the aging population in 2030. The question was what kind of living environment will the Thai elderly have for their aging life to ensure a good quality of life and well-being?

This study had adopted the age-friendly environment concept introduced by WHO in 2007 and 2015 (modified) and integrated the ecological theory of aging and the theory of consumer behavior in elucidating pre-aging adults’ willingness to live in age-friendly environment for their aging life. The objective is to understand how their

willingness to live in age-friendly environment is driven by their perceived age-friendly environment and their attitude towards living in age-friendly environment.

The empirical findings supported all hypotheses except the 2nd hypothesis (H2). In summary, housing indoor, transportation and communication services, social participation were significantly related to pre-aging adults' perceived age-friendly environment in the positive direction, while housing outdoor (H2) was not significantly related. Social participation had the strongest influence on perceived age-friendly environment.

The study explored the positive relationship of (1) perceived age-friendly environment to attitude towards living in age-friendly environment and (2) perceived age-friendly environment to willingness to live in age-friendly environment and (3) attitude towards living in age-friendly environment to willingness to live in age-friendly environment. This could be explained by the direct and indirect effects that pre-aging adults' perceived age-friendly environment influence on their willingness to live in age-friendly environment. Attitude towards living in age-friendly environment played a partial mediating role for the relationship between perceived age-friendly environment and willingness to live in age-friendly environment.

5.2. Benefits of the Study and Recommendation

Research studies regarding age-friendly environment had been inevitably conducted in Thailand since 2017. Most studies found that age-friendly environment plays an important role, in terms of both physical attributes and social participation, in the living quality of the elderly in Thailand (Tiraphat, 2017). This study first introduced and applied the ecological theory for aging and theory of consumer behavior to explain Thai pre-aging adults' perception about age-friendly environment, their attitude towards living in age-friendly environment and their willingness to live in age-friendly environment during their aging life. The empirical findings in this research study provided interesting implications in terms of both theoretical contribution and practical implication to be discussed.

5.2.1. Theoretical Contribution

The study results evidenced the relationship according to Lawton's ecological theory of aging, which explained that social (social participation) and physical (housing indoor and transportation and communication services) environments positively influenced Thai pre-aging adults' perception and attitude towards living in age-friendly environment, as summarized in Figure 5.1 below.



Figure 5.1 Relationships Explained by Ecological Theory of Aging

Pre-aging adults' willingness to live in age-friendly environment was influenced by their perceived age-friendly environment and their attitude towards living in age-friendly environment. These relationships displayed the behavior process according to the theory of consumer behavior. This research study explained empirical findings by the two relationships illustrated in Figure 5.2 and Figure 5.3. Extension of the study in the structural relationship indicated that attitude towards living in age-friendly environment played a role as a partial mediator between perceived age-friendly environment and willingness to live in age-friendly environment.



Figure 5.2 Relationships Explained by Theory of Consumer Behavior

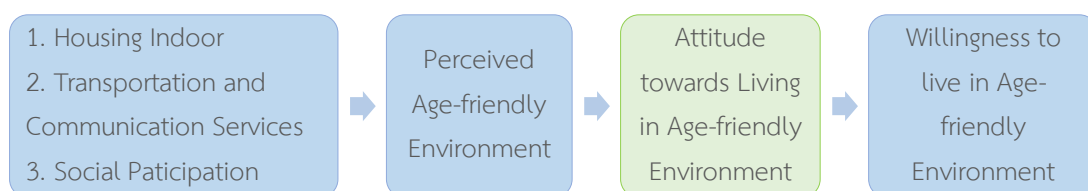


Figure 5.3 Attitude as a Partial Mediator of the PAF - WTL relationship

In terms of theoretical benefits for studying pre-aging adults' behavior in Thailand, the application of the ecological theory of aging and the theory of consumer behavior could explain the relationship processes between age-friendly environment and Thai pre-aging adults' willingness to live in age-friendly environment. As the structural relationship presented in Figure 5.4, the behavior willingness processes were driven through (1) Pre-aging adult's perceived of age-friendly environment, and consequently influenced on their attitude towards living in age-friendly environment, and then, influenced on their willingness to live in age-friendly environment. All these relationships were positive. Attitude towards living in age-friendly environment played a mediating role of the relationship. And (2) Pre-aging adult's perceived of age-friendly environment directly influenced their willingness to live in age-friendly environment in the positive direction.

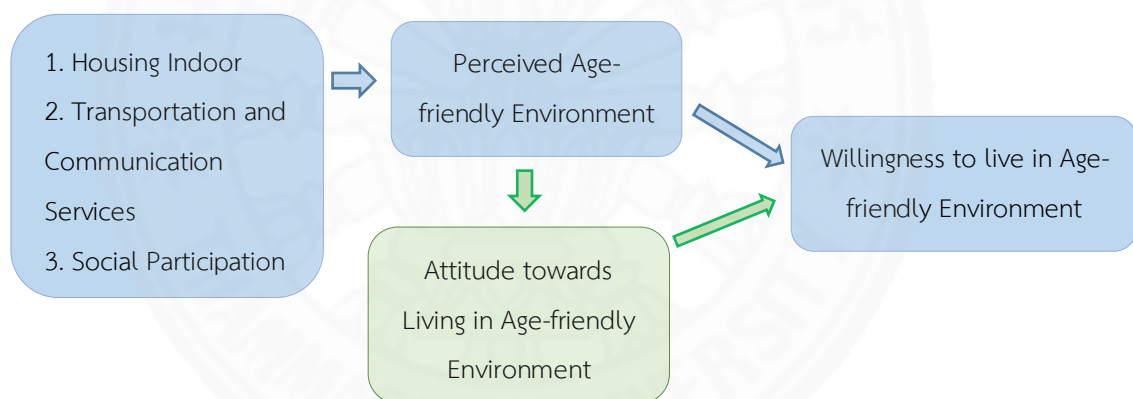


Figure 5.4 Relationships Explained by Age-friendly Environment Concept, Ecological Theory of Aging, and the Theory of Consumer Behavior

There were theoretical benefits that might be explored from the indirect and specific indirect effects of age-friendly variables to willingness to live in age-friendly environment, as previously presented in Table 4.16 and Table 4.17. For further theoretical extension, it might be studied how these age-friendly variables influenced directly not only on perceived age-friendly environment but also attitude towards living in age-friendly environment and willingness to live in age-friendly environment.

5.2.2. Practical Implication

The research study was the analysis on the consumer behavior process to find out the relationship of Thai pre-aging adults' perception in age-friendly attributes, their attitude towards living and willingness to live in age-friendly environment. The empirical findings enable real estate developers to focus on pre-aging adults as a main target, while the practical implications are suggested to be considered in two dimensions as follows:

(1) Manageable Age-friendly Environment Attributes

Age-friendly attributes that can be directly manageable by residential developers are housing indoor and social participation. Key implications for residential developers are how to innovate age-appropriate and age-supportive functions and designs of houses or residences in alignment with the elderly's desires. For example, housing indoor attributes should be an age-suitable size of house enabling the elderly to keep their house in good condition, cleanliness and well-maintenance. This is supported by the views of 43% of questionnaire respondents about housing maintenance as a housing burden. Design of houses should be taken into consideration as the elderly's independent life with (a) age-appropriate to support the daily lifestyle of the elderly, such as physical convenience, comfortable mobility, and accident prevention, and (b) age-security with a feeling of security from threats and/or intruders, such as installed security and guarding systems.

However, houses designed with age-safety features, such as emergency ambulance call systems for needed assistance, were not significantly related to perceived age-friendly environment. These features might not be necessary, as explained by the good health condition of 75% of the sample group respondents, current communication channels available and accessible, that enable them to be more easily connect with family and hospitals in cases of emergency.

Social participation was the attribute yielding the highest influence on willingness to live in age-friendly environment, through both perceived age-friendly environment and attitude towards living in age-friendly environment. Thai pre-aging adults mostly need to interact and participate with family members as usual and

occasionally interact with friends and colleagues. Residential project developers may allocate project space and resources in favor of their social activities or occasionally arrange activities and opportunities for their participation.

(2) Non-manageable Age-friendly Environment Attributes

Non-manageable attributes for residential project developers were transportation and communication services. Communications (including internet networks) services were significant for pre-aging adults' perception of age-friendliness. The coverage of infrastructure services is expected to support age-friendly living, in which residential developers may realize as key facility for the residential project development. Transportation and communication were important in supporting social participation, for example, facilitating the elderly to conveniently participate with family members, relatives, friends, and communities. Convenient access to services will also enable the elderly to live their usual life, such as easily visiting their daily life places, such as markets, retail shops, malls and leisure places, parks, and also medical or health centers.

The positive relationship of attitude towards living in age-friendly environment and willingness to live in age-friendly environment were significant. The sample respondents strongly agreed that they can obtain a good quality of aging life when living in age-friendly environment, and they tended to pay more to buy or lease residences located in age-friendly environment than normal market residences. Important information supporting this result should be tendency to relocate after retirement and tendency to pay more to buy or lease residences located in age-friendly environment than normal market residences. Respondents who are certain of relocating after retirement have tendency to pay more than the normal market price for buying residences located in age-friendly environment.

On the government side, authorities involved in gerontology planning and development could utilize this academic study findings as a part of policy guidelines for promoting age-friendly communities, both social and physical, and providing sufficient transportation, communication, and infrastructure facilities to enhance the elderly's quality of life.

5.3. Limitation and Suggestion for Further Research

The research study had extended the theories and the framework for analyzing willingness to live in age-friendly environment. There were several limitations associated with the study. Firstly, the qualified samples applicable to the model analysis were smaller than required. Data collection from the questionnaire (observations) had to be filtered by the criteria of data sampling and screened for normality distribution. Many observations were then deleted as outliers. In this study, 390 observations are required. After the data screening process, 360 observations from 434 qualified observations were applicable for running on SmartPLS3.3.3 structural model. A smaller sample size might cause a distortion in the validity and reliability of measurements. Secondly, few studies related to aging-friendly environment in Thailand had been undertaken. Most study references were from more experienced countries having different sociodemographic, economic, cultural, and other country fundamentals from Thailand. Some variables and measured variables selected for this study might not directly reflect attributes appropriate for Thai living environments. Thirdly, key latent constructs in the conceptual framework were perception, attitude, and willingness, in which some respondents might have no real and direct experience regarding age-friendly attributes. The answers in the questionnaire, thus, might not reflect opinions in real life. Lastly, the questionnaires were distributed and collected via online channels amid the social distancing policy during the COVID-19 pandemic. The answers in the questionnaire might not reflect true opinion.

To improve measurement model evaluation, other age-friendly indicators, apart from those used in this study, might be considered for inclusion in the further analysis. For theoretical extension, it is suggested to study how these age-friendly variables influence directly to not only perceived age-friendly environment but also attitude towards living in age-friendly environment and willingness to live in age-friendly environment. In addition, the needs of the elderly at different aging stages were different. A study by cluster comparison might be useful in discriminating behavior and intention by aging segment. Looking forward the concept of smart aging and sustainable age-friendliness should be adopted in the conceptual framework.

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APPENDICES



APPENDIX A

WHO's Eight Elements of Age-friendly Environment (2007, 2017)

1	Outdoor space and buildings	Surrounding environment attributes are satisfactory clean, green secure and safety surrounding environment. Clean, convenient, well-signed, well-maintenance and accessible public space, toilets, paveway, crossroad and seating area are provided to support the elderly's quality of aging life.
2	Transportation	Multi-types of public transportations, that are sufficient available, accessible, affordable, comfortable, age-appropriate and safety, indicate age-friendliness attributes. The age-suitable transportation will support the elderly in participating social activities and interaction, and going to places in their usual aging life, which can help improve their living quality.
3	Housing	Age-appropriate designed, modifiedable, comfortable, safety, secure, and affordable housing attributes are essential for the elderly's age in place. Housing design and functions are age-friendliness to support the elderly's daily and usual living life.
4	Social Participation	The elderly's age-friendly residence can influence on a feeling of safety, sufficient space and privacy at home, while having space for family and social connectedness. Accesible, affordable and age-suitable community activities will support the elderly's mental and health sustainment and improvement, due to the elderly's mitigation of loneliness and isolation..
5	Respect and social inclusion	Key element for the elderly's good health and well-being throughout their life are social inclusion and social support. In addition, valued and respectful interaction based on intergenerational activities are significant elements for age-friendliness.
6	Work and civic engagement	An age-friendly community provides options for the elderly to contribute and participate to their communities, through paid employment or voluntary work, and to be engaged in the political process. The ellderly will realize their value and useful engagement in community work.
7	Communication and information	Age-friendly attributes related to communication and information are properly provided through a variety of channels given not everyone having smartphone or home-based access to the internet. Information technology, especially computers and the internet, is age-appropriate for the elderly in comprehensiveness and convenience.
8	Community and Health Services	Health and support services are vital to the elderly's health sustainment and independent living. Aging-well services and efficient networks of community services will provide accessible and affordable health support for the elderly.

SOURCE: World Health Organization (WHO)

APPENDIX B

Priority Indicators for Age-friendly Environment

Age-friendly Housing Checklist, (Luciano , 2019)

Key Elements	Indicators
Affordability	Availability of affordable housing for the elderly
Essential Services	Affordable and available of age-essential services
Housing Design	Age-appropriate and well-structured housing
	Sufficient space to support for freely moving and mobility
	Appropriately-equipped housing with supportive environmental
	Age-adaptive housing and age-appropriate designed rooms
Modification	Age-suitable modified housing
	Age-affordable modifications of housing
	Readily available housing equipment for housing modifications
	Available financial assistance for home modifications.
Maintenance	Good understanding about age-modified housing needs for the elderly
	Affordable maintenance services
	Reliable and qualified house maintenance service
	Well-maintained public space, housing, and accommodation
Age in Place	Housing in location convenient to access services and facilities
	Affordable services provided to support ageing in place
	Well-informed of the available services to support aging in place
Community Integration	Community integration of age-friendly facilitated housing design
Housing Option	Availability of appropriate and affordable housing options
	Dedication of affordable and sufficient aging residence and housing
	Well-informed of the available housing options.
	Available appropriate services, amenities and activities
Housing Environment	Housing integration with the surrounding community.
	Not overcrowded housing and comfortable environment.
	Housing location in safety area prone to criminal and natural disasters.
	Feel safety living environment
	Financial assistance supported for housing security

Age-friendly Environment Indicators in Ireland
(Gibney & Shannon, 2018)

Goals	Key Elements	Indicators
Participation	Civic participation and employment	Opportunity to participate in monthly volunteering
		Opportunity to engage in political issue in the past 12 months
		Paid employment for older people aged more than 55 years
		Frequently participate in community group activities
		Accessible to lifelong learning in the past 12 months
	Social participation	Opportunity to meet friends, relatives or colleagues once a week
Health	Respect and social inclusion	Protect from experienced age-related discrimination
		Supportive for non-loneliness (some or all the time)
		Supportive for non-isolation (some or all the time)
	Communication and information	Easily getting information about health services
	Community supports and health services	Easily access local health services
		Accessible transport facilities to get health and social care services
		Received flu vaccination in past 12 months (age 65+)
Security	Transport	Walkable in the local area for good health or fitness
		Good local public transport
		Supportive public transport for doing essential tasks
	Housing	Currently driving capable.
		House in good facility and sufficient space
		Supportive housing conditions
	Age-friendly public spaces	Adequate house temperature control
		Accessible to essential services (e.g. local health services)
		Accessible to social services (e.g. shops, pubs, restaurants)
		Accessible to recreational or green area
		Feel safety at home and outside (day and night)
		Satisfied traffic light and not crowded pedestrian crossings
		Timing of pedestrian crossings and traffic light
		Available and accessible seats and resting places
		Available effective traffic calming measures
		Clean and well-managed garbage and litters
		Good condition and quality of paths and pavement
		Available and accessible public toilets

Priority Indicators of Age-friendly Environment in South Australia
(Zaman & Thornton, 2018)

Key Elements	Indicators
Outdoor Spaces and Buildings	Clean, pleasant and well-maintained local public areas
	Age-suitable local recreational facilities
	Sufficient open green spaces, adequate seating and suitable pathways
	Convenient and safely footpaths, supportive for wheelchairs/mobility
Transportation	Readable and understandable road signs
	Adequate and convenient parking for priority/disabled elderly
	Adequate local community transport services for disable people
	Promoting driving education and refreshing courses for all
Housing	Accessible information and assistance with home maintenance and modification
	Practical regulations for and available information about age-suitable homes modification
	Older people feel safe, secure and comfortable in their homes
	Age-suitable designed houses (i.e. step-free access, wheelchair,
Social Participation	Easily access local social venues, such as cinema, theatre, etc.
	Inclusive local events for older people
Respect and Social Inclusions	To be asked for consults about local issues
	Supportive decisions about elderly related issues
Civic Participation	Available information about local volunteering opportunities
	Available information about local paid employed opportunities
	Accessible to community training and educational opportunities
	Involved in local decision-making in public affairs
Communication and Information	Easy-to-understand information about local services and amenities
	Easily use of community customer service systems
	Accessible and assisted for using local libraries
Community and Health Services	Knowable on how to access in-home care and support services
	Well -trained staff in delivering council services to older people

Age-friendly Environment Indicators in Canada
(Orpana, 2016)

Key Elements	Indicators
Housing	Housing maintenance cost burden
	Well equipped physical features of housing
	Need for house modification to alleviate physical inconvenience and prevent accident
Transportation	Reliable and frequent facilities of public transportation
	Vehicles with accessible, priority seating offer and not crowded
	Easily access to local buses or subways and free shuttle or community buses services
	Seating area provided in the buses and subways
	Careful bus drivers, safety bus services
	Easily to use buses or subways to the places in daily lifes
Neighborhood	Shaded seating and benches at bus stops
	Clean and well maintenance of surrounding public spaces i.e. parks, roads, sidewalks
	Easily to access from home to walking trails and parks
	Good condition sidewalks, no obstructions and safe for walking
	Age-supported traffic signals and safety for cross the road
Social	Safety for using crosswalks and narrow roads
	Friendly bicycling way for safety of pedestrians
	Participable venues for most of the events and activities
Environment and Participation	Age-suitable time to attend entertainment, leisure, and sports activities
	Easily obtain and convenient access the information about the community activities
	Opportunity to participate in social activities.
	Opportunities to join community services
Social Inclusion	Sufficient and sustained assistance and community support
	Respectful to senior people in the community
	Kind and helpful staff at community and district level
	Age-specific activities and events provided for all generations
	Respectful in social interactions
Communication and Health Services	Better serves and improvement service quality for older people
	Easily and safely access to use health and welfare center
	Helpful staff at public facilities (hospital and welfare center)
	Easily access to programs and information on health, mental and physical education.
	Free or low fee computer and the Internet

APPENDIX C

Questionnaire

Title: Willingness to Live in Age-friendly Environment

This questionnaire is a part of the Degree of Master of Science's Thesis in Real Estate Program at Thammasat University. The purpose of this research is to obtain your opinion and attitude regarding living in age-friendly environment.

Thank you very much for your kind cooperation in answering the questions. All the personal information you provided in this questionnaire will be keep in confidence.

Questionnaire consists of 4 parts:

- Part I Filter questions
- Part II Questions about your opinion on age-friendly environment
- Part III Questions about your opinion and attitude regarding willingness to live in age-friendly environment
- Part IV Personal Information

Miss Raithiwa Naruemol, Student ID 6202034465

M.S. Student Real Estate Business Program, Faculty of Accountant and Business Administration, Thammasat University

PART I: Filter Question

Please tick on the answer of your information

1. You are 50-59 years old
☐ Yes ☐ No (Questionnaire completed)
2. You can live independently, with no caretaking assistant
☐ Yes ☐ No (Questionnaire completed)

PART II: Questions about your opinion on age-friendly environment

Please: imagine about your future aging life, what attributes of age-friendly environment that match with you.

Please select the score indicating your opinion on age-friendly environment.

Score ranking are as follows:

- SCORE 1 Strongly Disagree
 SCORE 2 Disagree
 SCORE 3 Neither Agree Nor Disagree
 SCORE 4 Agree
 SCORE 5 Strongly Agree

Please mark (/) in the tick box that match to your opinion

HSI	Housing Indoor What attributes of age-friendly environment for your residence when you are elderly?	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
		(1)	(2)	(3)	(4)	(5)
HSI1	House is designed and decorated with mood and tone as elderly's taste and style to value in terms of psychological health and happiness.					
HSI2	House is age-suitable in size for the elderly to keep good house condition and maintenance					
HSI3	House is well equipped and functioned for elderly's independent daily lifestyle					
HSI4	House is age-appropriate designed to support with elderly daily life such as physical convenient, comfortable mobility, and accident prevention					
HSI5	House is designed with age-security features with feeling of security from threats and/or intruders, such as installed security system					
HSI6	House is designed with age-safety features such as emergency ambulance call system when need assistance					

HSO	Housing Outdoor What attributes of age-friendly environment for your residence when you are elderly?	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
		(1)	(2)	(3)	(4)	(5)
HSO1	Opened green space and shaded trees surrounding your house					
HSO2	Clean and well-maintained opened space and building surrounding your house					
HSO3	Safety and security with communities and neighbors surrounding house					
HSO4	Condition surrounding residences support to your health such as low or no noise /odor/air pollution					
HSO5	Existence of reachable recreation and leisure area such as by walk, bike riding, automobile driving					

TRC	Transportation and Communication Services What attributes of age-friendly environment for your residence when you are elderly?	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
		(1)	(2)	(3)	(4)	(5)
TRC1	Convenient and safety for family members, relatives, and friends to visit you					
TRC2	Convenient access to hospital and medical services					
TRC3	Convenient access to join social and religion activities					
TRC4	Convenient access to visit recreation and leisure places					
TRC5	Convenient access to visit places in daily life, such as market, retail shop, mall					
TRC6	Accessible to communication channels as usual daily life.					
TRC7	Accessible to internet networks as usual daily life.					

SOC	Social Participation What attributes of age-friendly environment for your residence when you are elderly?	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
		(1)	(2)	(3)	(4)	(5)
SOC1	Capable to interact and interpersonal participate with family members as usual life					
SOC2	Occasionally interact with friends and colleague as usual life					
SOC3	Good relationship and respectful interaction with neighbors and community members					
SOC4	Opportunities for learning to keep up with new knowledge for supporting aging life through offline and online channels					
SOC5	Opportunity to participate community activities occasionally					
SOC6	Experience of respect and exchange among inter-age with no age discrimination					

PART III: Questions about your opinion on your perceived age-friendly environment, your attitude towards living in age-friendly environment and your willingness to live in age-friendly environment.

Please select the score indicating your opinion on age-friendly environment.

Score ranking are as follows:

- SCORE 1 Strongly Disagree
- SCORE 2 Disagree
- SCORE 3 Neither Agree Nor Disagree
- SCORE 4 Agree
- SCORE 5 Strongly Agree

Please mark (/) in the tick box that match to your opinion

PAF	Perceived Age-friendly Environment	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
		(1)	(2)	(3)	(4)	(5)
PAF1	You perceive age-friendly environment is reflected by comfortable in independent living					
PAF2	You think age-friendly environment is reflected by accessible to public services					
PAF3	You think age-friendly environment is reflected by social connectivity					
PAF4	You think age-friendly environment is reflected by security in life and property from outside threats					
PAF5	You think age-friendly environment is reflected by safety from daily living					

ATL	Attitude Towards Living in Age-friendly Environment	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
		(1)	(2)	(3)	(4)	(5)
ATL1	You think you can obtain good quality of aging life when living in age-friendly environment					
ATL2	You think your health can sustain and improve when living in age-friendly environment					
ATL3	You think you are non-isolation and active when living in age-friendly environment					
ATL4	You think you can achieve life satisfaction when living in age-friendly environment					
ATL5	You think you can securely live until late life when living in age-friendly environment					

WTL	Willingness to Live in Age-friendly Environment	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
		(1)	(2)	(3)	(4)	(5)
WTL1	You plan to move to live in age friendly environment in the future					
WTL2	You think about your residence with age-friendly environment to live until the end of your life					
WTR3	You intend to live in residences located in age-friendly environment for your aging life					
WTR4	You plan to buy residence with age-friendly environment to live until the end of your life					
WTR5	If you want to buy or lease residences for aging in place, you tend to pay more to buy or lease residences located in age-friendly environment than normal market residences					

PART IV: Personal Information

Please mark in the tick box that match you

1. Age
 ☐ 50 – 54
 ☐ 55 – 59
 ☐ Not specified
2. Gender
 ☐ Male
 ☐ Female
 ☐ Other
3. Marital Status
 ☐ Single
 ☐ Married
 ☐ Other
4. Highest Education
 ☐ < Bachelor
 ☐ Bachelor
 ☐ > Bachelor
5. Monthly revenue (Baht/Month)
 ☐ < 10,000
 ☐ 10,000 – 30,000
 ☐ 30,001 – 50,000
 ☐ 50,001 – 70,000
 ☐ 70,001 – 90,000
 ☐ > 90,000
6. Health condition
 ☐ Very good
 ☐ Good
 ☐ Normal
 ☐ Severe bad
 ☐ Congenital disease
 ☐ A little sick
7. Location residence
 ☐ in Bangkok
 ☐ in Vicinity
 ☐ in Province
8. Type of residence
 ☐ SDH
 ☐ Townhouse
 ☐ Condominium
 ☐ Rental room
 ☐ Apartment
 ☐ Others

9. Current residence ☐ Owned ☐ Resident ☐ Wellfare
10. Residence Satisfaction ☐ Very pleasure ☐ Moderate pleasure ☐ Less pleasure
11. Burden of residence ☐ Loan payment ☐ Maintenance ☐ Safety
☐ Neighbor ☐ Sanitary ☐ Others.
12. Transportation ☐ Convenient ☐ High cost ☐ Not convenient
13. Tendency to relocate ☐ Pretty Sure ☐ Not yet decided ☐ Not thinking
after retirement
- 14 Residence after retirement ☐ Owned ☐ Elderly residence ☐ Relative
☐ Rent ☐ Welfare ☐ Others

Questionnaire completed.

Thank you

APPENDIX D

แบบสอบถามที่ใช้ในงานวิจัย

เรื่อง ความเต็มใจพักอาศัยในสิ่งแวดล้อมที่เป็นมิตรต่อผู้สูงอายุ

แบบสอบถามนี้เป็นส่วนหนึ่งของการศึกษาและทำวิทยานิพนธ์ของนักศึกษาระดับปริญญาโท คณะพาณิชยศาสตร์และการบัญชี สาขาธุรกิจอสังหาริมทรัพย์ มหาวิทยาลัยธรรมศาสตร์ โดยมีวัตถุประสงค์ในการวิจัยเพื่อศึกษาทัศนคติและความคิดเห็นเกี่ยวกับความเต็มใจพักอาศัยในสิ่งแวดล้อมที่เป็นมิตรต่อผู้สูงอายุ ทั้งนี้ข้อมูลส่วนบุคคลของท่านจะถูกเก็บเป็นความลับ

แบบสอบถามชุดนี้มี 4 ส่วน ประกอบด้วย

- ส่วนที่ 1 คำถามคัดกรอง
- ส่วนที่ 2 คำถามแสดงความเห็นเกี่ยวกับปัจจัยที่เป็นมิตรต่อผู้สูงอายุ
- ส่วนที่ 3 คำถามแสดงความเห็นเกี่ยวกับความเต็มใจพักอาศัย
ในสิ่งแวดล้อมที่เป็นมิตรต่อผู้สูงอายุ
- ส่วนที่ 4 ข้อมูลทั่วไปของผู้ตอบแบบสอบถาม

ขอขอบคุณอย่างยิ่งสำหรับการร่วมมือตอบแบบสอบถามมา ณ โอกาสนี้ ขอแสดงความนับถือนางสาวไรทิวา นฤมล
นักศึกษาปริญญาโท โครงการธุรกิจอสังหาริมทรัพย์ คณะพาณิชยศาสตร์และการบัญชี
มหาวิทยาลัยธรรมศาสตร์

ส่วนที่ 1: คำถามคัดกรองผู้ตอบแบบสอบถาม

คำชี้แจง: โปรดให้ข้อมูลดังต่อไปนี้

1. ท่านมีอายุอยู่ในช่วง 50 – 59 ปีหรือไม่
☐ ใช่ ☐ ไม่ใช่ (จบแบบสอบถาม)
2. ท่านสามารถใช้ชีวิตประจำวัน โดยไม่ต้องมีพยาบาลคอยดูแลประจำหรือไม่
☐ ใช่ ☐ ไม่ใช่ (จบแบบสอบถาม)

ส่วนที่ 2: แบบสอบถามเพื่อสำรวจความคิดเห็นเกี่ยวกับปัจจัยแวดล้อมที่เป็นมิตรต่อผู้สูงอายุ

คำชี้แจง: ขอให้ท่านนึกถึงในยามที่ท่านเป็นผู้สูงอายุในอนาคต ท่านต้องการพักอาศัยในสถานที่ที่มีปัจจัยแวดล้อมที่เป็นมิตรในลักษณะอย่างไร

โปรดเลือกระดับคะแนนที่ตรงกับระดับความคิดเห็นของท่านที่มีต่อสิ่งแวดล้อมที่เป็นมิตรต่อผู้สูงอายุ

โดยระดับคะแนนมีดังนี้

- ระดับคะแนนที่ 1 คือ ไม่เห็นด้วยอย่างยิ่ง
 ระดับคะแนนที่ 2 คือ ไม่เห็นด้วย
 ระดับคะแนนที่ 3 คือ เฉย ๆ
 ระดับคะแนนที่ 4 คือ เห็นด้วย
 ระดับคะแนนที่ 5 คือ เห็นด้วยอย่างยิ่ง

โปรดทำเครื่องหมาย (/) ในช่องว่างที่ตรงกับระดับความคิดเห็นของท่านต่อข้อความต่อไปนี้

HSI	ปัจจัยด้านลักษณะภายในตัวบ้าน ท่านคิดว่าที่พักอาศัยที่มีปัจจัยแวดล้อมเป็นมิตรต่อท่าน ในช่วงสูงอายุ มีลักษณะอย่างไร?	ไม่เห็นด้วย อย่างยิ่ง	ไม่เห็นด้วย	เฉย ๆ	เห็นด้วย	เห็นด้วย อย่างยิ่ง
		(1)	(2)	(3)	(4)	(5)
HSI1	การออกแบบตกแต่งที่ให้อารมณ์และความรู้สึกที่มีความสุข และให้คุณค่าด้านจิตใจแก่ท่านในช่วงสูงอายุ					
HSI2	ขนาดของบ้านเหมาะสมกับท่านในช่วงสูงอายุ ที่จะมีกำลังความสามารถในการดูแลบำรุงรักษาให้ถูกสุขลักษณะและอยู่ในสภาพที่ดี					
HSI3	ห้องภายในบ้านตกแต่งให้มีอุปกรณ์ใช้งานครบครันเหมาะสมสำหรับการดำรงชีวิตของท่านในช่วงสูงอายุ					
HSI4	การออกแบบภายในตัวบ้านเหมาะสมและเอื้อต่อการดำเนินชีวิตประจำวันของท่านในช่วงสูงวัย เช่น ให้ความสะดวกทางกายภาพ ความคล่องตัว และป้องกันการเกิดอุบัติเหตุได้					
HSI5	การออกแบบภายในตัวบ้านที่ทำให้ท่านรู้สึกปลอดภัยจากการบุกรุกและภัยคุกคาม (Security) เช่น มีระบบความปลอดภัยและป้องกันภัยจากภายนอก					
HSI6	การออกแบบภายในตัวบ้านที่ทำให้ท่านรู้สึกปลอดภัยในการดำเนินชีวิต (Safety) เช่น มีระบบเรียกรถพยาบาลฉุกเฉินในยามที่ไม่สามารถช่วยเหลือตัวเองได้					

HSO	ปัจจัยด้านลักษณะภายนอกตัวบ้าน ท่านคิดว่าที่พักอาศัยที่มีปัจจัยแวดล้อมเป็นมิตรต่อท่านในช่วง สูงอายุ มีลักษณะอย่างไร?	ไม่เห็นด้วย อย่างยิ่ง	ไม่เห็นด้วย	เฉยๆ	เห็นด้วย	เห็นด้วย อย่างยิ่ง
		(1)	(2)	(3)	(4)	(5)
HSO1	ภายนอกที่พักอาศัยของท่านรายล้อมด้วยต้นไม้สีเขียว มีร่มเงา ให้ความร่มรื่นต่อท่านในช่วงสูงอายุ					
HSO2	บริเวณพื้นที่โล่งและอาคารรอบๆบ้านท่านมีความสะอาดและ ได้รับการดูแลรักษาอย่างดี ทำให้มีสุขอนามัยที่ดี					
HSO3	บ้านของท่านอยู่ในชุมชนและเพื่อนบ้านใกล้เคียงที่มีความมั่นคง ปลอดภัยต่อท่านในช่วงสูงอายุ					
HSO4	สภาพแวดล้อมรอบบ้านช่วยส่งเสริมภาวะสุขภาพของท่านในวัย สูงอายุ เช่นมลภาวะเสียง อากาศ และกลิ่นในระดับต่ำหรือไม่มี					
HSO5	ท่านได้รับความสะดวกในการเข้าถึงพื้นที่พักผ่อนและสันทนาการ ส่วนกลาง เช่น สามารถเดิน ขี่รถ หรือขี่รถจักรยานไปถึง ได้สะดวก					

TRC	ปัจจัยด้านบริการการเดินทางและการสื่อสาร ท่านคิดว่าที่พักอาศัยที่มีปัจจัยแวดล้อมเป็นมิตรต่อท่าน ในช่วงสูงอายุ มีลักษณะอย่างไร?	ไม่เห็นด้วย อย่างยิ่ง	ไม่เห็นด้วย	เฉยๆ	เห็นด้วย	เห็นด้วย อย่างยิ่ง
		(1)	(2)	(3)	(4)	(5)
TRC1	สมาชิกในครอบครัวญาติพี่น้อง หรือเพื่อนของท่านสามารถ เดินทางมาเยี่ยมสังสรรค์ได้อย่างสะดวกและปลอดภัย					
TRC2	ท่านสามารถเดินทางไปยังโรงพยาบาล หรือศูนย์สุขภาพ ได้ อย่างสะดวกและปลอดภัย					
TRC3	ท่านสามารถเดินทางไปเข้าร่วมกิจกรรมทางสังคมและ ศาสนาได้อย่างสะดวกและปลอดภัย					
TRC4	ท่านสามารถเดินทางไปในสถานที่สันทนาการและพักผ่อน หย่อนใจได้อย่างสะดวกและปลอดภัย					
TRC5	ท่านสามารถเดินทางไปยังสถานที่ในชีวิตประจำวันได้สะดวก และปลอดภัย เช่น ตลาด ร้านขายของ หรือศูนย์การค้า					
TRC6	ท่านสามารถเข้าถึงบริการการขนส่งและสื่อสารในช่องทาง ต่างๆได้ตามปกติในชีวิตประจำวัน					
TRC7	ท่านสามารถเข้าถึงบริการเครือข่ายอินเทอร์เน็ตได้ตามปกติ ในชีวิตประจำวัน					

SOC	ปัจจัยด้านการมีส่วนร่วมทางสังคมกับครอบครัว เพื่อน และคนในชุมชน ท่านคิดว่าที่พักอาศัยที่มีปัจจัยแวดล้อมเป็นมิตรต่อท่าน ในช่วงสูงอายุ มีลักษณะอย่างไร?	ไม่เห็นด้วย อย่างยิ่ง	ไม่เห็นด้วย	เฉย ๆ	เห็นด้วย	เห็นด้วย อย่างยิ่ง
		(1)	(2)	(3)	(4)	(5)
SOC1	ท่านสามารถพบปะสังสรรค์และทำกิจกรรมกับสมาชิกใน ครอบครัวตามปกติ					
SOC2	ท่านสามารถพบปะสังสรรค์และทำกิจกรรมกับเพื่อนใน โอกาสต่างๆ ตามปกติ					
SOC3	ท่านมีความสัมพันธ์ที่ดี มีความเคารพนับถือ และเกื้อกูล กันกับเพื่อนบ้านและคนในชุมชน					
SOC4	ท่านมีโอกาสนในการเรียนรู้ติดตามความรู้ใหม่ ๆ เพื่อ รองรับชีวิตสูงวัยผ่านช่องทางออฟไลน์และออนไลน์					
SOC5	ท่านมีโอกาสร่วมกิจกรรมของชุมชนหรือองค์กรใน ชุมชนในโอกาสต่าง ๆ ในช่วงสูงอายุ					
SOC6	ท่านมีโอกาสดำเนินการรับประสบการณ์ของการเคารพนับถือและ การแลกเปลี่ยนกันระหว่างรุ่น โดยไม่มีการกีดกันผู้สูงวัย					

**ส่วนที่ 3: แบบสอบถามเพื่อสำรวจความคิดเห็นเกี่ยวกับการรับรู้ของท่านต่อสิ่งแวดล้อมที่เป็นมิตร
ต่อผู้สูงอายุ ทศนคติของท่านต่อการอาศัยอยู่ในสิ่งแวดล้อมที่เป็นมิตรต่อผู้สูงอายุ และ ความเต็ม
ใจของท่านที่จะอาศัยอยู่ในสิ่งแวดล้อมที่เป็นมิตรต่อผู้สูงอายุ**

โปรดเลือกระดับคะแนนที่ตรงกับระดับความคิดเห็นของท่านที่มีต่อสิ่งแวดล้อมที่เป็นมิตรต่อผู้สูงอายุ
โดยระดับคะแนนมีดังนี้

- | | |
|---------------------|----------------------|
| ระดับคะแนนที่ 1 คือ | ไม่เห็นด้วยอย่างยิ่ง |
| ระดับคะแนนที่ 2 คือ | ไม่เห็นด้วย |
| ระดับคะแนนที่ 3 คือ | เฉย ๆ |
| ระดับคะแนนที่ 4 คือ | เห็นด้วย |
| ระดับคะแนนที่ 5 คือ | เห็นด้วยอย่างยิ่ง |

โปรดทำเครื่องหมาย (/) ในช่องว่างที่ตรงกับระดับความคิดเห็นของท่านต่อข้อความต่อไปนี้

PAF	การรับรู้ถึงสิ่งแวดล้อมที่เป็นมิตรต่อผู้สูงอายุ	ไม่เห็นด้วย อย่างยิ่ง	ไม่เห็นด้วย	เฉยๆ	เห็นด้วย	เห็นด้วย อย่างยิ่ง
		(1)	(2)	(3)	(4)	(5)
PAF1	ท่านรับรู้ความสามารถในการใช้ชีวิตสูงวัยอย่างมีอิสระ และสะดวกสบาย สะท้อนถึงสภาวะที่เป็นมิตรต่อผู้สูงอายุ					
PAF2	ท่านรับรู้ว่าการมีสุขภาพที่ดีตามวัยสะท้อนถึง สภาวะที่เป็นมิตรต่อผู้สูงอายุ					
PAF3	ท่านรับรู้ว่าการเข้าถึงบริการสาธารณะได้อย่างสะดวก ตามปกติ สะท้อนถึงสภาวะที่เป็นมิตรต่อผู้สูงอายุ					
PAF4	ท่านรับรู้การเชื่อมต่อกันทางสังคม เช่น การมีส่วนร่วมในสังคม สะท้อนถึงสภาวะที่เป็นมิตรต่อผู้สูงอายุ					
PAF5	ท่านรับรู้ว่าการได้รับความปลอดภัยในชีวิตและทรัพย์สิน สะท้อนถึงสภาวะที่เป็นมิตรต่อผู้สูงอายุ					

ATL	ทัศนคติต่อการอาศัยในสิ่งแวดล้อมที่เป็นมิตรกับผู้สูงอายุ	ไม่เห็นด้วย อย่างยิ่ง	ไม่เห็นด้วย	เฉยๆ	เห็นด้วย	เห็นด้วย อย่างยิ่ง
		(1)	(2)	(3)	(4)	(5)
ATL1	ท่านคิดว่าการมีคุณภาพชีวิตที่ดีเกิดขึ้นได้หากท่านพักอาศัยอยู่ในสภาพแวดล้อมที่เป็นมิตรต่อผู้สูงอายุ					
ATL2	ท่านคิดว่าท่านสามารถรักษาและฟื้นฟูสุขภาพให้ดีขึ้นได้หากท่านพักอาศัยอยู่ในสภาพแวดล้อมที่เป็นมิตรต่อผู้สูงอายุ					
ATL3	ท่านคิดว่าท่านไม่รู้สึกลำบาก และมีความกระฉับกระเฉง หากท่านพักอาศัยอยู่ในสภาพแวดล้อมที่เป็นมิตรต่อผู้สูงอายุ					
ATL4	ท่านคิดว่าท่านสามารถบรรลุความพึงพอใจในชีวิตหากท่านพักอาศัยอยู่ในสภาพแวดล้อมที่เป็นมิตรต่อผู้สูงอายุ					
ATL5	ท่านคิดว่าท่านสามารถใช้ชีวิตจนถึงบั้นปลายด้วยความปลอดภัยในชีวิตและทรัพย์สิน หากท่านพักอาศัยอยู่ในสภาพแวดล้อมที่เป็นมิตรต่อผู้สูงอายุ					

WTL	ความเต็มใจในการพักอาศัยในสิ่งแวดล้อมที่เป็นมิตร ต่อผู้สูงอายุ	ไม่เห็นด้วย อย่างยิ่ง	ไม่เห็นด้วย	เฉยๆ	เห็นด้วย	เห็นด้วย อย่างยิ่ง
		(1)	(2)	(3)	(4)	(5)
WTL1	ท่านวางแผนที่จะย้ายไปพักอาศัยในสิ่งแวดล้อมที่เป็นมิตรต่อผู้สูงอายุในอนาคต					
WTL2	ท่านคิดเกี่ยวกับที่พักอาศัยในสิ่งแวดล้อมที่เป็นมิตรต่อผู้สูงอายุที่สามารถให้ท่านใช้ชีวิตจนถึงบั้นปลายได้					
WTL3	ท่านตั้งใจที่จะใช้ชีวิตในที่พักอาศัยที่อยู่ในสิ่งแวดล้อมที่เป็นมิตรต่อผู้สูงอายุจนถึงบั้นปลายชีวิต					
WTL4	ท่านวางแผนที่จะซื้อที่พักอาศัยในสิ่งแวดล้อมที่เป็นมิตรต่อผู้สูงอายุที่สามารถให้ท่านใช้ชีวิตจนถึงบั้นปลายได้					
WTL5	ถ้าท่านต้องการซื้อหรือเช่าที่พักอาศัยเพื่อพักอาศัยในวัยสูงอายุ ท่านมีแนวโน้มที่จะยอมจ่ายเงินเพิ่มเพื่อซื้อที่พักอาศัยในสิ่งแวดล้อมที่เป็นมิตรต่อผู้สูงอายุมากกว่าจะซื้อที่พักอาศัยแบบปกติ					

ส่วนที่ 3 ข้อมูลทั่วไปของผู้ตอบแบบสอบถาม

โปรดตอบคำถามต่อไปนี้

- อายุ ☐ 50 – 54 ปี ☐ 55 – 59 ปี
- เพศ ☐ ชาย ☐ หญิง ☐ ไม่ระบุ
- สถานภาพสมรส ☐ โสด ☐ สมรส ☐ อื่นๆ
- การศึกษาที่สูงที่สุด ☐ ต่ำกว่าปริญญาตรี ☐ ปริญญาตรี ☐ สูงกว่าปริญญาตรี
- รายได้ส่วนบุคคลต่อเดือน (บาท/เดือน) ☐ ต่ำกว่า 10,000 ☐ 10,000 – 30,000 ☐ 30,001 – 50,000
☐ 50,001 – 70,000 ☐ 70,001 – 90,000 ☐ มากกว่า 90,000
- สุขภาพโดยรวมของท่าน ☐ ดีมาก ☐ ดี ☐ ปกติ
☐ เป็นโรคร้ายแรง ☐ มีโรคประจำตัว ☐ มีโรคเล็กน้อยๆ
- บ้านพักอาศัยในปัจจุบัน ☐ อยู่ในกรุงเทพ ☐ อยู่ปริมณฑล ☐ อยู่ต่างจังหวัด
- ประเภทบ้านพักอาศัยในปัจจุบัน ☐ บ้านเดี่ยว ☐ ทาวน์เฮ้าส์ ☐ คอนโด
☐ ห้องเช่า ☐ อพาร์ทเมนต์ ☐ อื่นๆ

9. บ้านพักอาศัยในปัจจุบัน ☐ บ้านของตัวเอง ☐ บ้านของผู้อื่น ☐ บ้านพักสวัสดิการ
10. ความพึงพอใจในบ้านพักอาศัยในปัจจุบัน ☐ พึงพอใจมาก ☐ พึงพอใจปานกลาง ☐ พึงพอใจน้อย
11. ภาระของบ้านพักอาศัยในปัจจุบัน ☐ ภาระการผ่อน ☐ ภาระการบำรุงรักษา ☐ ความปลอดภัย ☐ ปัญหาเกี่ยวกับเพื่อนบ้าน ☐ ความสะอาดอนามัย ☐ อื่นๆ.....
12. การเดินทางจากบ้าน ☐ สะดวกสบาย ☐ ค่าใช้จ่ายเดินทางสูง ☐ ไม่สะดวกสบาย
13. แนวโน้มในการย้ายบ้านหลังจากปลดเกษียณ ☐ ค่อนข้างแน่นอน ☐ ยังไม่ตัดสินใจ ☐ ไม่คิดจะย้าย
14. บ้านที่คิดจะย้ายไปอยู่หลังปลดเกษียณ ☐ บ้านตัวเอง ☐ บ้านผู้สูงอายุ ☐ บ้านญาติ ☐ บ้านเช่า ☐ บ้านสวัสดิการ ☐ อื่นๆ.....

จบการทำแบบสอบถาม

ขอขอบคุณอย่างยิ่งสำหรับการร่วมมือตอบแบบสอบถามมา ณ โอกาสนี้ ขอแสดงความนับถือ

APPENDIX E

Sociodemographic Data and Information of Respondents

General Information of Respondents

Demographic		Frequency	Percent
Gender	Male	126	35.00
	Female	233	64.70
	Not specified	1	0.30
	Total	360	100.00
Age	50 – 54 years old	142	39.40
	55 – 59 years old	218	60.60
	Total	360	100.00
Marital Status	Single	109	30.30
	Married	229	63.60
	Other (Divorced)	22	6.10
	Total	360	100.00
Education Level	< Bachelor	44	12.20
	Bachelor	176	48.90
	> Bachelor	140	38.90
	Total	360	100.00
Monthly Revenue (Baht/Month)	< 10,000	22	6.10
	10,000 – 30,000	78	21.70
	30,001 – 50,000	62	17.20
	50,001 – 70,000	71	19.70
	70,001 – 90,000	36	10.00
	> 90,000	91	25.30
	Total	360	100.00

Housing and Living Condition of Respondents

Housing and Living Condition		Frequency	Percent
Health Condition	Very good	40	11.10
	Good	128	35.60
	Normal	97	26.90
	Severely ill	2	0.60
	Congenital disease	48	13.30
	Slightly ill	45	12.50
	Total	360	100.00
Residence Location	In Bangkok	182	50.60
	In Metropolitan Area	74	20.60
	In Province	104	28.90
	Total	360	100.00

Housing and Living Condition		Frequency	Percent
Type of Residence	SDH	221	61.40
	Town house	71	19.70
	Condominium	31	8.60
	Rental room	3	0.80
	Apartment	6	1.70
	Others	28	7.80
	Total	360	100.00
Property Right	Owned	307	85.30
	Resident/Rent	45	12.50
	Welfare	8	2.20
	Total	360	100.00
Residence Satisfaction	Very satisfied	205	56.90
	Moderately satisfied	142	39.40
	Less satisfied	13	3.60
	Total	360	100.00
Burden of Residence	Loan payment	61	16.90
	Maintenance	155	43.10
	Safety	32	8.90
	Neighbors	26	7.20
	Sanitary	38	10.60
	Other (No burden)	48	13.30
	Total	360	100.00
Transportation	Convenient	314	87.20
	High cost	27	7.50
	Not convenient	19	5.30
	Total	360	100.00
Tendency to Relocate after Retirement	Pretty sure	63	17.50
	Not yet decided	145	40.30
	Not thinking	152	42.20
	Total	360	100.00
Residence after Retirement	Owned	297	82.50
	Elderly residence	24	6.70
	Relative	19	5.30
	Rent	1	0.30
	Welfare	2	0.60
	Other (Not yet)	17	4.70
	Total	360	100.00

BIOGRAPHY

Name	Miss Raithiwa Naruemol
Date of Birth	June 29, 1966
Educational Attainment	1995: Master of Arts in Economics (English Program), THAMMASAT UNIVERSITY 1988: Bachelor of Arts in Economics (English Program), THAMMASAT UNIVERSITY
Work Position	Senior Executive Vice President TRIS Rating Co., Ltd.
Scholarship (If any)	Year 1992: Saint John's College of Commerce Full Scholarship Year 1993: Saint John's College of Commerce Full Scholarship
Publications (If any)	2020: Rating Methodology for Savings Cooperatives in Thailand www.trisarating.com 2019: Sovereign Rating Methodology www.trisarating.com 2018: Rating Methodology for Non-bank Finance Company www.trisarating.com 2017: Rating Methodology for Securities Company www.trisarating.com 2017: Group Rating Methodology www.trisarating.com 1995: Master of Arts Thesis, THAMMASAT UNIVERSITY

“Factors determining the success of savings group in rural savings mobilization: a case study at the village level in Saraburi province”

Work Experiences (If any)

2019-Present:

Research Institution

TRIS Rating Co., Ltd.

2001-2019:

Credit Rating Department

TRIS Rating Co., Ltd.

1997-2001:

Money and Banking Analysis Department

Kasikorn Research Institution

1995-2001:

Research Department

Siam Sanwa Industrial Finance and Securities

1989-1992:

Project Coordinator (GTZ direct hired)

Thai-German Highland Development Program

Chiangmai-Chiangrai-Mae Hongson

1988 -1989:

Research Department

Siam Commercial Bank