

THE INTERNATIONAL JOURNAL OF BUSINESS & MANAGEMENT

Management of Housing Innovation for Better Quality of Life in the Future

Thammachart Kulprapha

Doctoral Candidate, California University FCE, Los Angeles, California, USA

Dr. Ornpapha Chutikorntaweasin

Associate Professor, California University FCE, Los Angeles, California, USA

Dr. Thuchapon Yodthong

Associate Professor, California University FCE, Los Angeles, California, USA

Abstract:

The research purposes were 1) to study the components of management of housing innovation, 2) to study the components of better quality of life in the future, 3) to study the relationship between the components of management of housing innovation and better quality of life in the future, 4) to study the components of management of housing innovation affecting better quality of life in the future, and 5) to present the model of management of housing innovation for better quality of life in the future. The researcher applied the quantitative research method in conducting this study. The research results show that the components of management of housing innovation in total were at the highest level. In particular, Security had the highest mean score, followed by Accessibility, Emergency preparedness, Utilization and Environment respectively. The hypotheses results show that the components of management of housing innovation had a relationship with better quality of life in the future with the statistical significance at level of .01 and .05. Regarding the prediction power analysis of each predictive variable affecting better quality of life in the future, the prediction power of 12 variables: 2 variables of Security (SE), 2 variables of Utilization (UT), 2 variables of Accessibility (AC), 3 variables of Emergency preparedness (EM), and 3 variables of Environment (EN), was 93.80%. It can create the prediction equation in the form of standard score, as follows;

$$Y = 1.415 + 1.047SE_2 + .591SE_3 + .192UT_1 + .239UT_3 + .239AC_1 + .872AC_2 + .161EM_1 + .237EM_2 + .205EM_3 + .159EN_1 + .104EN_2 + .181EN_3$$

Keywords: Management, housing innovation, better quality of life in the future

1. Introduction

United Nations set the agenda about the "sustainable development" by indicating 17 sustainable development goals (SDGs). One of the goals is concerned about sustainable cities and communities; it means people can access the safe and appropriate residence, and develop the habitation to achieve the well-being in living. This is to support the good living of everyone in all age ranges (The UN Country Team in Thailand, 2015). Four basic needs, shelter, food, clothing and medicine, are vital for people to survive. The most important one is shelter which can create happiness and good life quality; people have different type of shelter depending on individual demand.

Up till now, the trend of popularity of residence has been changed depending on time, age, financial status and cost of living (Anant, 2015). The construction of Thai houses nowadays is applied to the individual utilization, and uses the simple and inexpensive materials. Most houses are built with cement in the form of high building. As the more and more roads are built, traveling by car is more convenient; thereby, this causes the change in the living conditions of Thai people. The popularity of living in condominium can reflect modern society that prefers the convenience. In addition, area in urban society is limited, especially in Bangkok because the land is expensive. Some people face problem in accessing low-cost residence; they have to pay more residence cost, but the living space is the same size or smaller. Besides, the life quality gets worse (Thonglor, 2017).

These changes have occurred among the competition in residence market between old and new real estate entrepreneurs. Both of them have applied the management strategies to increase their competitive advantage. One of the strategies that play an important role is the strategies of innovation and technology, including conducting research and new design in order to create the specific market, and to employ the material technology for reducing the cost and upgrading the product quality (Ruschatawuttipong, 2018). This marketing competition is the supportive factors to create more housing innovation, for example, to design the most useful living space, to design the accessibility to be convenient for getting in and out of the house both in normal time and emergency case so that the residents in all age ranges can access and utilize every parts of the house conveniently. In addition, it is to prepare to handle the emergency situation; when an emergency occurs in the house, the residents have prepared the equipment or the house building is well designed in order to cope with the emergency situation. The environment management is also an important factor (Khamsrichan,

2011). Moreover, safe home care is important in aspect of both life and property, because safe home care makes the family members feel comforted (Kanda Group, 2018) and it can improve the life quality of resident.

With these reasons, the residence management in new dimension is necessary. The continual invention of innovation will help differentiate the business to be unbeatable. Also the management, it can create value to satisfy the consumers. Therefore, the researcher is interested in studying the management of housing innovation for better quality of life in the future. This research will create new knowledge whose results can be applied in creating concepts and developing the useful housing products for better quality of life of people in the society.

2. Research Purposes

- To study the components of management of housing innovation.
- To study the components of better quality of life in the future.
- To study the relationship between the components of management of housing innovation and better quality of life in the future.
- To study the components of management of housing innovation affecting better quality of life in the future.
- To present the model of management of housing innovation for better quality of life in the future.

3. Research Hypotheses

- H1: The components of management of housing innovation have a relationship with components of better quality of life in the future.
- H1₁: The components of safety have the relationship with the components of better quality of life in the future.
- H1₂: The components of utilization have the relationship with the components of better quality of life in the future.
- H1₃: The components of accessibility have the relationship with the components of better quality of life in the future.
- H1₄: The components of emergency preparedness have a relationship with the components of better quality of life in the future.
- H1₅: The components of environment have the relationship with the components of better quality of life in the future.
- H2: The components of management of housing innovation affect the better quality of life in the future.
- H2₁: The components of management of housing innovation affect the physical and mental well-being.
- H2₂: The components of management of housing innovation affect the personal freedom.
- H2₃: The components of management of housing innovation affect the social relation.

4. Research Paradigm

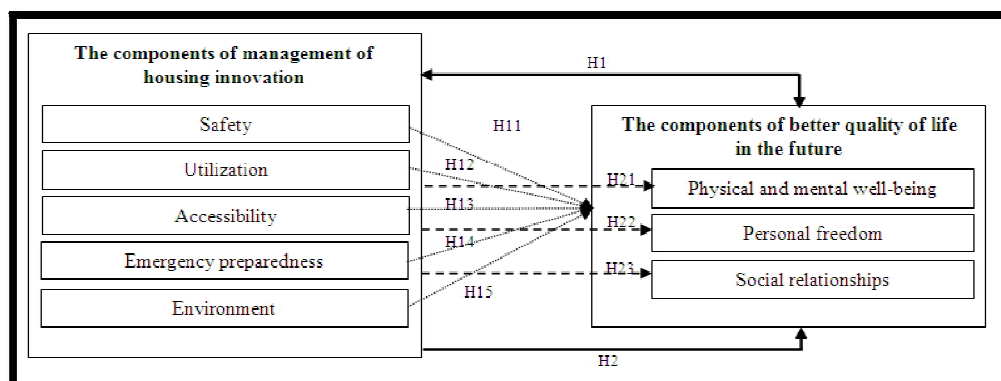


Figure 1: Research Paradigm

5. Literature Review

5.1. Concept and Theory about Housing Innovation

Characteristics of housing in the next decade will be changed from those in nowadays. The house will have an ability of self-checking, which is to use the technology to check the basic housing system. The materials and methods used in construction will be more ready-made and environmental friendly. There will be all kind of communication system in a house. The house will have better flood protection system. The house will be friendlier to the disabled, the elderly and children. The house style will be more contemporary Thai, and have more green area. The roof garden will be more popular. People will favor second-hand house. In addition, the house will be easier to be maintained because of its smaller size but changeable capability. The safety efficiency in preventing the robbery will be necessary (Theptaranont, 2009). In addition, Price water house Coopers (2014) also predicted the changes in real estate business in 2020 that real estate industry will be greatly expanded at more than 55%, comparing to 2012. The fast growing cities will cause the largest social migration which will lead to the biggest construction ever. The innovation on technology and sustainability will be a

key driver in value creation. Every building must be rated its sustainability. Moreover, the cooperation with the government will be necessary to reduce the risk of a project that may not be successful. The entrepreneur might have to develop the fast growing but more risky property; or focus on the branches with the fast growth, the possibility of wide risk, also the newly occurred risk.

5.2. Concept and Theory about Safety of Residence

The safety measures are different depending on types of residential buildings. The modern buildings are generally concerned about the environment that is safe and good for health. Therefore, it is important that the building design should focus on preventing the possible danger that may occur with the residents more than using the individual safety equipment. The focus should be also placed on the management process or procedure to prevent the damage, the scope of health care, the safety, and the welfare for residents, including the physical and mental health of residents. Moreover, the problems, health care, safety and welfare should be well considered in every process: planning, designing, constructing, operating, maintaining, improving and eliminating at last (National Institute of Building, 2017a). Baan LaeSuan (2017a) described the house design for safety that, first, the appropriate room location, such as bedroom of the elderly should be located on the ground floor where everyone in the house can access and provide the fastest help in emergency time. Secondly, the lighting is indispensable; the room with sunlight will support the good surrounding atmosphere of the house. Thirdly, the installation of additional equipment, for example, installing a handle in hazardous area will provide an anchor instead of grabbing furniture that is vulnerable to falling. The last, the floor cannot be neglected; the houses where the elderly and children live usually avoid the excessive different levels of house floor. Petch wongsak (2018) presented the robbery-prevention technology that the first part is the alarm signals or burglar alarm, consisting of sensor, receiver or control unit, and the alarm section. The second part is CCTV. The third part is the safe. The fourth part is the automatic emergency lighting. The last part is the safety door and window.

5.3. Concept and Theory about Utilization of Residence

Moffatt and Russell (2001) presented three guidelines about living space. First is to utilize the space effectively; the changeable buildings tend to utilize the same amount of space and material more effectively. Second is the increased lifespan; to increase the lifespan of all parts of building must not cause an impact on environment. Third is work performance improvement; the change will be easier with the modern technology, and the innovation and technology that help benefit the resident and reduce cost. In addition, AP Thailand (2018) studied the behavior of present residence buyers, and found that the trend of living is multi generation living. Therefore, the role of each space in the house should be well managed. Every space must be designed based on the understanding on human scale and different behavior of resident at each age. Most people prioritize the design for healthy living which responds to the utilization of both common area and home area, such as universal design.

5.4. Concept and Theory about Accessibility of Residence

Baan LaeSuan (2017b) suggested about accessibility of residence with the technique of selecting home project. The issues that should be considered are that the house should be in a convenient location, not too far from entrance-exit. The location of the house should be convenient to commute to work and conveniently access to other necessary places, such as hospital, school, office, and department store. AP Thailand (2018) presented concept about smart home living; the technology is applied to facilitate the resident. The first priority of the resident is the role of technology in surveillance or assistance for family members to be safe from danger promptly.

5.5. Concept and Theory about Emergency Preparedness of Residence

National Disability Authority (2010) presented the evacuation guidelines for an emergency. Due to the different physical conditions, the different methods must be used to make each person aware of emergency situations. The residents with different physical conditions will respond to an emergency situation differently, for example, the time used in evacuating, and the evacuation types to safe place, which are vertical and horizontal evacuation. These depend on types of emergency situations, types of residential building, and the evacuation system of that building. In addition, National Disability Authority (2010) also described the risk assessment as the process to indicate the dangerous situations and find the solution to reduce risk to be in the acceptable level. The risk will be different depending on characteristics of the residents being controlled to be in the safe place and being uncontrolled. The risk and emergency response measures will depend on the design, building plan, and construction. The risk assessment should be reviewed every year. Moreover, the designer should consider the risk assessment principles when designing the new building in aspect of universal design, lifetime worthiness, and continual improvement. The evacuation training is important for improving the emergency plan. National Institute of Building Sciences (2017b) indicated the basic plan to reduce damage from natural disaster that the damage reduction is the key to cope with the emergency situation and to recover after the situation. The damage mitigation will reduce the subsequent impact when the situation is harmful to the property. Therefore, the risk reduction technique must be applied in the most various types of risk as possible. The high effective building should be designed with strategies beyond construction restrictions to resist the disaster.

5.6. Concept and Theory about Environment of Residence

Mianklang (2007) defined the livable house that it can manage the environment to contribute to good physical and mental health of family members, including the visitors and surrounding community. The benefits of livable house are the environment contributing to good physical and mental health, good habits in environmental sanitation and health

behavior, the prevention and reduction of disease rate, accident, mental health problem and crime in the society, and the warm family with love and care. These all are essential factors to develop the country and communities to be strong, loving, harmonious, and to cooperate in developing the society. In addition, the lovable house should be clean, orderly, cool and pleasant. The ventilation and lighting should be appropriate. The house should be cleaned regularly. The waste should be separated before disposing. The water for consumption should be clean. The electric equipment and electronics should be always in good condition, ready to be used; and they should be left turn on unnecessarily. According to AKANEK Editorial Board (2012), the principles of housing environment management are divided into 4 aspects: air quality, lighting, sound and noise, and design and utilization.

5.7. Concept and Theory about Quality of Life

The quality of life means the feeling of satisfaction to live with happiness. It consists of 4 dimensions; physical, psychological, social relationships, and environment. Besides, it is to live at the level that is appropriate to people depending on the basic needs which respond to the demand of physical, mental, emotion, society and thought sufficiently. Importantly, to have good quality of life should not cause an impact on oneself and society (UNESCO, 1978; The WHOQOL Group, 1995; Khantho, 2014; Phakdeekhiriphraiwan, 2016). Lalaeng (2013) described the importance of quality of life that it is to be strong and healthy, to reduce the personal expense, to work effectively, and to earn good living. When people in the society have good quality of life, the quality of the society and country will be better. However, the public sector should set the policy contributing to develop the quality of life, for example, education, working, and income of the populations. Hughes (1990) indicated the components of quality of life; 1) The personal freedom, 2) The cultural factor concerning about guidelines to live together happily, 3) The social integration is the social connection, social role, social right and responsibility, 4) The meaningful activity, 5) The environment quality, 6) Economic and social status, 7) Physical and mental well-being, and 8) Life satisfaction.

6. Research Methodology

The researcher applied the quantitative research method in conducting this research; studying and retrieving the secondary data from reviewing the concepts and theories from documents and related researches; collecting the primary data by distributing the questionnaires to 400 samples, people living in the area of Bangkok. The statistics used in this research were frequency, percentage, mean, standard deviation, Pearson Correlation and Multiple Regression Analysis (MRA).

7. Research results

7.1. The Analysis of Demographic Profiles

With regard to the demographic profiles, the results show that from 400 respondents, most were female, aged 41-45 years, finished the master degree, earned 65,001 – 85,000 Baht per month, lived with 3-4 family members in the single house, and operated their own business. With regard to the attitudes towards innovative housing products, the results show that most respondents were interested in news about housing technology and equipment, and made 3-4 visits at the exposition about housing technology, product, decorating equipment and furnishing within these two years.

7.2. The Analysis of the Components of Management of Housing Innovation

With regard to the components of management of housing innovation, in total, the components of management of housing innovation were at the highest level ($\bar{x} = 4.21$, S.D. = 0.32). In particular, Security had the highest mean score ($\bar{x} = 4.44$, S.D. = 0.62), followed by Accessibility ($\bar{x} = 4.40$, S.D. = 0.54), Emergency preparedness ($\bar{x} = 4.20$, S.D. = 0.55), Utilization ($\bar{x} = 4.08$, S.D. = 0.53) and Environment ($\bar{x} = 3.95$, S.D. = 0.44) respectively (see table 1).

Management of Housing Innovation	\bar{x}	S.D.	Translation	Ranking
1. Security(SE_T)	4.44	0.62	Highest	1
2. Accessibility(AC_T)	4.40	0.54	Highest	2
3. Emergency preparedness (EM_T)	4.20	0.55	High	3
4. Utilization (UT_T)	4.08	0.53	High	4
5. Environment (EN_T)	3.95	0.44	High	5
Total	4.21	0.32	Highest	

Table 1: Mean and Standard Deviation of the Components of Management of Housing Innovation in Total and in Particular

7.3. The Analysis of the Components of Better Quality of Life in the Future

With regard to the components of better quality of life in the future, in total, the components of better quality of life in the future were at high level ($\bar{x} = 3.95$, S.D. = 0.29). In particular, Physical and mental well-being had the highest mean score ($\bar{x} = 4.02$, S.D. = 0.38), followed by Social relationships ($\bar{x} = 4.01$, S.D. = 0.46), and Personal freedom ($\bar{x} = 3.83$, S.D. = 0.48) respectively (see table 2).

Better Quality of Life in the Future	\bar{X}	S.D.	Translation	Ranking
1. Physical and mental well-being	4.02	0.38	High	1
2. Social relationships	4.01	0.46	High	2
3. Personal freedom	3.83	0.48	High	3
Total	3.95	0.29	High	

Table 2: Mean and Standard Deviation of the Components of Better Quality of Life in the Future in Total and in Particular

7.4. The Analysis of the Relationship between the Components of Management of Housing Innovation and Better Quality of Life in the Future

With regard to the relationship between the components of management of housing innovation and better quality of life in the future, the results show that the components of management of housing innovation had a relationship with better quality of life in the future with the statistical significance at level of .01 and .05. The correlation was between .106 and .652. The relationship which had the highest correlation was the relationship between Using material or technology that reduces the resource usage (EN₃) and Better quality of life in the future (QA_T). The relationship with the lowest correlation was the relationship between having the evacuation system to safe place quickly (EM₃) and Better quality of life in the future (QA_T). However, the relationship between Design of home-use and use of safety-critical materials in every dimension (SE₁) and Better quality of life in the future (QA_T) did not have the statistical significance (see table 3).

Variables	\bar{X}	S.D.	SE ₁	SE ₂	SE ₃	UT ₁	UT ₂	UT ₃	AC ₁	AC ₂	AC ₃	EM ₁	EM ₂	EM ₃	EN ₁	EN ₂	EN ₃	QA _T	
SE ₁	4.29	0.62	1.000																
SE ₂	4.49	0.80	.641**	1.000															
SE ₃	4.53	0.66	.759**	.654**	1.000														
UT ₁	3.92	0.49	.380**	.360**	.442**	1.000													
UT ₂	4.10	0.65	.018	.287**	-.296**	.470**	1.000												
UT ₃	4.22	0.69	.081	.132**	.006	.703**	.642**	1.000											
AC ₁	4.46	0.81	.636**	.801**	.635**	.344**	.074	.151**	1.000										
AC ₂	4.25	0.71	.390**	.530**	.265**	-.039	.080	.171**	.529**	1.000									
AC ₃	4.50	0.50	.509**	.620**	.488**	-.056	.063	.272**	.355**	.498**	1.000								
EM ₁	4.24	0.78	.022	.412**	-.062	-.181**	.327**	.266**	.059	.109	.365**	1.000							
EM ₂	4.29	0.63	.384**	.231**	.506**	.408**	.006	.333**	.014	.077	.177**	.014	1.000						
EM ₃	4.06	0.70	.273**	.606**	.296**	.051	.235**	.220**	.220**	.007	.456**	.843**	.332**	1.000					
EN ₁	3.83	0.48	.474**	.230**	.237**	.338**	.125*	.030	.228**	.015	.129**	.013	.007	.101*	1.000				
EN ₂	3.97	0.70	.081	.458**	.193**	.080	.257**	.238**	.068	.500**	.630**	.305**	.364**	.362**	.282**	1.000			
EN ₃	4.04	0.74	.338**	.478**	.113*	.158**	.392**	.011	-.304**	.094	.044	.353**	.087	.503**	.269**	.114*	1.000		
QA _T	3.95	0.29	.042	.183**	.201**	.203**	.454**	.112*	.246**	.364**	.271**	.242**	.489**	.106*	.304**	.392**	.652**	1.000	

Table 3: The Correlation between the Components of Management of Housing Innovation and Better Quality of Life in the Future

**The Statistical Significance at .01

*The Statistical Significance at .05

7.5. The Analysis of Prediction Power of Each Good Predictive Variable to Predict the Better Quality of Life in the Future

The researcher applied the stepwise regression to test the significance of the multiple regressions of good predictive variables and criterion variables with the F-test. The results show that the multiple regressions of 12 variables had the statistical significance at the level of .01; which were Having the equipment and system that increase the safety in life and property (SE₂), Utilizing the room space for various purposes (UT₁), Having the common area to do activities for maximize its benefit (UT₃), Locating near the public services (AC₁), Having the communication technology that can contact to the helping center directly (AC₂), Having the emergency warning system with technology that can communicate all channels (EM₁), Arranging the safe place to handle the emergency situation (EM₂), Having the evacuation system to safe place quickly (EM₃), Using the technology to eliminate the pollution for the sanitation (EN₁), Using the material, decorating equipment and furniture that are safe for health (EN₂), and Using material or technology that reduces the resource usage (EN₃). These 12 predictive variables can well predict the criterion variable by that the prediction power had the statistical significance at the level of .01 and .05. All predictors had the prediction power at 93.8%; the multiple regressions were .968; the standard error of estimate was .073; the constants of prediction equation was 1.415 (see table 4).

Variables	b	β	SE _b	t
SE ₂	.377	1.047	.026	-14.387**
SE ₃	.261	.591	.019	13.758**
UT ₁	.114	.192	.021	5.339**
UT ₃	.100	.239	.016	-6.126**
AC ₁	.085	.239	.017	-4.907**
AC ₂	.355	.872	.014	25.230**
EM ₁	.060	.161	.018	3.270**
EM ₂	.109	.237	.015	7.153**
EM ₃	.085	.205	.022	3.904**
EN ₁	.096	.159	.011	9.129**
EN ₂	.043	.104	.014	3.086**
EN ₃	.071	.181	.012	6.118**
	R = .968	SE _{est} = .073	F = 485.332**	
	R ² = .938	a = 1.415		

Table 4: The Multiple Regression of Prediction Power of the Components of Safety, Utilization, Accessibility, Emergency Preparedness, and Environment, Each Good Predictive Variable Affecting Better Quality Of Life In The Future
**The Statistical Significance at .01

The researcher can write the prediction equation in the form of standard score, as follows;
The prediction equation of the better quality of life in the future by 12 good predictive variables
 $Y = 1.415 + 1.047SE_2 + .591SE_3 + .192UT_1 + .239UT_3 + .239AC_1 + .872AC_2 + .161EM_1 + .237EM_2 + .205EM_3 + .159EN_1 + .104EN_2 + .181EN_3$

7.6. The Presentation of Model of Management of Housing Innovation for Better Quality of Life in the Future

The researcher created this model from 12 components of the management of housing innovation for better quality of life in the future (see figure 2).

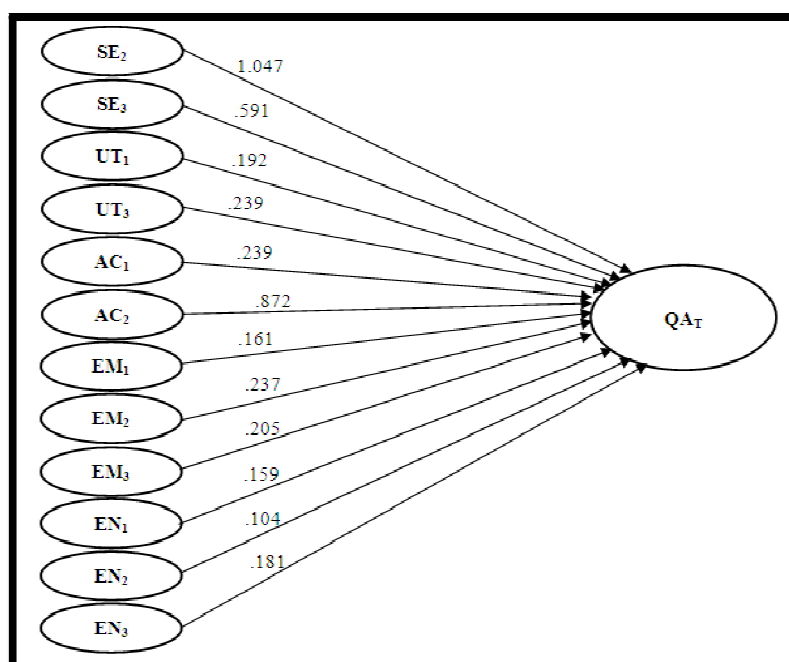


Figure 2: The Model of Management of Housing Innovation for Better Quality of Life in the Future

8. Discussion

The components of management of housing innovation for better quality of life in the future in the aspect of Security consisted of 2 variables; Having the equipment and system that increase the safety in life and property (SE₂) and Designing the public utilities to be safe from outsiders (SE₃). This is relevant to the concepts of Canadian Wood Council (2000), National Institute of Building (2017a), Fraunhofer Building Innovation Alliance (2012), Baan LaeSuan (2017a), and Petchwongsak (2018) that the innovation on safety of residence means the safety of life of residents, building and properties from all disasters, for example, conflagration which is a main danger of residence; the construction materials must reduce the accident rate and prevent fire. In addition, the natural disasters are, for example, flood and earthquake; including the danger from outsiders, such as robbery.

The residence design for safety should be the primary priority, including the installation of technology system and equipment to modernize the safety in order to prevent the robbery and provide safety.

The components of Utilization consisted of 2 variables; Utilizing the room space for various purposes (UT₁) and having the common area to do activities for maximize its benefit (UT₃). This is relevant to the concepts of Moffatt and Russell (2001), Ali and Aksamija (2008), Hasanvand, Bemaniyan, and Aminkhojastehghamari (2014), and AP Thailand (2018) that the innovation on utilization of residence, especially in urban area with the limited space and high density of housing, the area utilization should be well manage for the highest effectiveness. It means there should be the careful planning in indicating and designing, including the arrangement of area proportion for each type of activities which will not disturb other activities at the same time. Meanwhile, the area utilization should be flexible, in terms of location adjustment or the adjustment of material to fit the application. These all are importantly based on the strength and safety of residence.

The components of Accessibility consisted of 2 variables; Locating near the public services (AC₁) and Having the communication technology that can contact to the helping center directly (AC₂). This is relevant to the concepts of HIA National Policy Congress (2013), Baan LaeSuan (2017b), and AP Thailand (2018) that the innovation on utilization of residence in urban society should be planned since the process of design. People at every age, including the disabled, can access their residence conveniently. The residence should have convenient entrance-exit in both normal time and emergency. Besides, the residence should not be located too far from public service or necessary places, for example, hospital, official place, and office. In the age of digital, the communication technology should be applied in facilitating and helping the residents promptly.

The components of Emergency preparedness consisted of 3 variables; having the emergency warning system with technology that can communicate all channels (EM₁), arranging the safe place to handle the emergency situation (EM₂) and having the evacuation system to safe place quickly (EM₃). This is relevant to the concepts of National Disability Authority (2010) and National Institute of Building Sciences (2017b) that the innovation on emergency preparedness of the residents with different ages and readiness of physical condition should be varied. The safe place for emergency should be prepared in advance because when an emergency really occurs, the residents might not be able to manage themselves to evacuate to safe place on time or help themselves safely. It is very important that designing and planning should be realized to reduce the risk of the unexpected incidents and to mitigate the impact of the emergency situations. The warning or rescue technology should be used for handling the emergency situations more effectively.

The components of Environment consisted of 3 variables; Using the technology to eliminate the pollution for the sanitation (EN₁), Using the material, decorating equipment and furniture that are safe for health (EN₂) and Using material or technology that reduces the resource usage (EN₃). It is relevant to the concepts of Mianklang (2007) and AKANEK Editorial Board (2012) that the innovation on environment of residence has 2 dimensions which are the interior dimension and the exterior dimension. The interior dimension is directly important to residents due to the daily routine; therefore, if the environment of lighting, smelling, noise and sound, including the decoration equipment which is safe from any harmful substance to human body, plus with the use of technology to reduce the pollution and balance the area of residence, the residents will have better quality of life.

9. Recommendations

- The real-estate entrepreneur should develop the equipment for the safety of residence in housing area and surrounding area in order to prevent the danger from outsiders by using modern technology to assure the safety and respond to the need of the residents.
- The real-estate entrepreneur should develop the design of living space of the same room to suit various purposes and also the common area to do activities for maximizing its benefit.
- The real-estate entrepreneur should select the location which is near the government agencies or business center. There should be easy access routes for traveling from the residence to the public services. There should also be the communication technology that can contact to the helping center directly.
- The real-estate entrepreneur should install the emergency warning system with technology that can communicate all channels, arrange the safe place to handle the emergency situation and indicate the evacuation system to safe place quickly. The real-estate entrepreneur should collaborate with the organization or agencies responsible to this issue.
- The real-estate entrepreneur should use the material, decorating equipment and furniture that are safe for health and free from any harmful substance to residents at all ages, use the material or technology that reduces the resource usage to reach the highest effectiveness and reduce the construction cost. In addition, the real-estate entrepreneur should also use the technology to eliminate the pollution, such as to eliminate the bad smell from the garbage room, for the sanitation of the residents.

10. References

- AKANEK Editorial Board. (2012) .Good health can be created with the home environment. Retrieve from <https://community.akanek.com/th/story/สุขภาพที่ดีสร้างได้ด้วยสิ่งแวดล้อมภายในบ้าน>
- Ali, M. M. and Aksamija, A. (2008). Toward a Better Urban Life: Integration of Cities and Tall Buildings. The 4th Architectural Conference on High Rise Buildings. 9-11th June 2008.
- Anant, W. (2015). House: the reflection of value of people in Thai society. Retrieve from <http://arts.tu.ac.th/culture/010558.pdf>

- iv. AP Thailand. (2018). AP described 3 trends of multi generation living, launched new big campaigns, book a new townhome in 21 new projects. Retrieve from <https://www.brandbuffet.in.th/2018/10/ap-21-destiny-multi-generation/>
- v. Baan LaeSuan. (2017a). Design the safe house to support the living of the elderly in the family. Retrieve from <http://www.baanlaesuan.com/51014/homeguru/home-pro-mar-1/>
- vi. Baan LaeSuan. (2017b). 4 guides to select the right house project. Retrieve from <http://www.baanlaesuan.com/56637/design/property-guide/>
- vii. Canadian Wood Council.(2000). Fire Safety in Residential Buildings. Retrieve from http://cwc.ca/wp-content/uploads/publications-BP2_FireSafetyResidential.pdf
- viii. Fraunhofer Building Innovation Alliance. (2012). Building for the future – the future for building. Retrieve from https://www.fraunhofer.de/content/dam/zv/en/Institutes/Brochure_Fraunhofer%20BAU.pdf
- ix. Hasanvand, S., Bemaniyan, M.R., and Aminkhojastehghamari, M. (2014). The consideration of high-rise building role in utilization of urban open space (Case study: region 1of Tehran metropolitan). *American Journal of Engineering Research*, 3(4), 135-143.
- x. HIA National Policy Congress.(2013). Accessibility in Residential Buildings. Retrieve from <https://hia.com.au/-/media/HIA-Website/Files/Media-Centre/Policies/accessibility-in-residential-buildings.ashx>
- xi. Hughes, R.A.C. (1990). Guillain-Barr Syndrome. Heidelberg: Springer-Verlag.
- xii. Kanda Group. (2018). Home safety tips. Retrieve from <http://www.kd.co.th/>
- xiii. Khamsrichan, W. (2011).The creation of ecosystem in the house, community, city and hometown for increasing the water area. Retrieve from <https://www.gotoknow.org/posts/466083>
- xiv. Khantho, N. (2014). Quality of Life of People in Community Service Area of Pattana Medical Center.Master of Political Sciences, General Administration, College of Public Administration, Burapha University.
- xv. LaLaeng, P. (2013). Study in quality of life and factors influencing quality of life of oil palm farming in south of Thailand. Maejo University.
- xvi. Mianklang, P. (2007). What is livable house? Retrieve from <https://www.gotoknow.org/posts/78559>
- xvii. Moffatt, S. and Russell, P. (2001).Assessing the Adaptability of Buildings. Retrieve from [file:///C:/Users/com/Downloads/APS-CAAssessingtheAdaptabilityofBuildings%20\(1\).pdf](file:///C:/Users/com/Downloads/APS-CAAssessingtheAdaptabilityofBuildings%20(1).pdf)
- xviii. National Disability Authority. (2010). Safe Evacuation for All: A Planning and Management Guide. Retrieve from <http://nda.ie/nda-files/Safe-Evacuation-for-All1.pdf>
- xix. National Institute of Building Sciences.(2017a). Occupant Safety and Health. Retrieve from <https://www.wbdg.org/design-objectives/secure-safe/occupant-safety-health>
- xx. National Institute of Building Sciences.(2017b). Natural Hazards Mitigation. Retrieve from <https://www.wbdg.org/design-objectives/secure-safe/natural-hazards-mitigation>
- xxi. Petchwongsak, S. (2018).Supporter to prevent robbery, burglar alarm and etc. Retrieve from <http://www.baanlaesuan.com/79233/maintenance/home-protection/>
- xxii. Phakdeekhiriphraiwan, P. (2016). Quality of life of the people in Ban Saentor community, Village no. 11, Thapha Sub-district, KoKha District, Lampang Province. Master of Social Work, the Branch of Administration and Policy on Social Welfare, Faculty of Social Work, Thammasat University.
- xxiii. PricewaterhouseCoopers. (2014). Real Estate 2020: Building the future. Retrieve from <https://www.pwc.com/sg/en/real-estate/assets/pwc-real-estate-2020-building-the-future.pdf>
- xxiv. Ruschatawuttipong, Y. (2018). Model of Management Strategies Affecting Crisis Management of Real Estate Business. *The International Journal of Business & Management*, 6(1), 147-152.
- xxv. The UN Country Team in Thailand. (2015). Goals: from MDGs to SDGs. Retrieve from <https://www.un.or.th/globalgoals/th/the-goals/>
- xxvi. The WHOQOL GROUP. (1995). The World Health Organization Quality of Life Assessment (WHOQOL): position paper from the World Health Organization. *Social Sciences Medicine*, 41 (10): 1403-1409.
- xxvii. Theptaranont, Y. (2009). Types of residence in the next decade. Retrieve from <http://www.tcdc.or.th/articles/design-creativity/14437/#รูปแบบที่อยู่อาศัยในทศวรรษหน้า>
- xxviii. Thonglor, T. (2017).6 crisis factors about urban residence for people in medium-low class and thinking trend about house and condominium in the future. Retrieve from <https://propholic.com/prop-talk/6-ปัจจัยวิกฤติที่อยู่อาศัย/>
- xxix. UNESCO.(1978). Indicators of Environmental Quality and Quality of Life. Paris: UNESCO.