

A Study on Factors affecting the residents in Hong Kong to consider the use of Smart Home Technology

HHH COMPANY

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2227330

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Abstract

Purpose: The aim of this study is to identify the factors that significantly influence the usage intention of residents live in Hong Kong. The results provide insights for HHH to make strategic decisions confidently with the evidence-based and to make differentiate in the industry to reinforce the brand image.

Design/methodology/approach: The study used quantitative approach that includes data analysis and documentary analysis. The survey subjects were 156 residents in Hong Kong surveyed and the data used the Statistical Package for the Social Sciences (SPSS) as the principal analytical tool. Based on a rigorous and thorough methodology, the results are trustworthy.

Research Findings: This study aimed to assess the importance of factors influencing the use of smart building technologies by residents. The study explores the impact of safety, cost, convenience, and reliability on willingness to use. The survey results show that participants are still mainly concerned about security issues, namely property protection and disclosure of personal data. Interestingly, cost is not a concern. The results will help make informed decisions that meet their specific needs.

Research Limitations/Implications: It is crucial to consider factors beyond fundamental factors, customer experience and brand image. These are considered as useful for the future research that can provide valuable insights into how these variables influence usage intentions.

Practical implications: Reinforces HHH's brand image as an innovative property management company. Therefore, it is critical to understand the impact of intent of use on security, cost, convenience, and reliability. Taking all these factors into account, HHH can better identify the causes and increase the results of the use of smart building technologies to guide ideal services and enhance brand image.

Originality/Value: In the highly competitive property management market, identifying the factors that influence the decision to use SBT is critical. This study provides valuable insights into key determinants of resident intentions and may help HHH improve current services on SBT to meet residents' needs in SBT.↵

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Keywords: Property management company, usage intention, security, cost, convenient reliability, Smart building Technology (SBT)↵

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Declaration/Statements page

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Signed (candidate)

Date 23 April 2024.....

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Other sources are acknowledged by footnotes giving explicit references.
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Acknowledgement

Chapter 1 Introduction

One is needs of human is to have a shelter to stay. (Forbes, 2022) There are always a need for human to have a shelter area to stay. Residential flats are always the needs for Hong-Kongers. (Habitat for Humanity Hong Kong, 2023) Chiu (2006) pointed out that Mei Foo Sun Village was the first appeared in Hong Kong in the late 1960s as professional property management company. After its successful implementation, similar management solutions in property have been widely adopted by other Private developers in Hong Kong. The developer chooses to set up a subsidiary to undertake management work to have the smooth from construction transit to users.

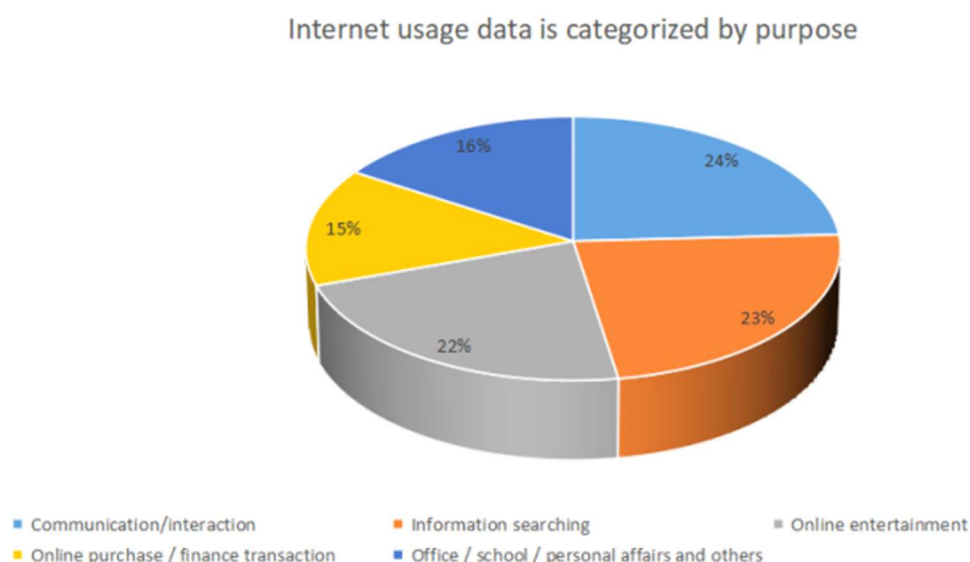
Property is one of the main industries in Hong Kong which the buildings need to oversee by professional to secured and managed. Created market in such a huge demand and market for property management (PM) in the quality services. The new release of next planning from the government and to catch up with development of China in Smart city which is the coming trend of the change of the industry. (Deloitte China, 2020, Atha et al., 2020, 2023 KPMG, 2023) Smart city is the world trend of modernize city which can also increase the competitive power Hong Kong ranked as 19 out of 141 increased from 33 out of 118 in 2021 (IMD, 2023) The world ranking of the competitive power in Hong Kong had been decreased last year (Hong Kong's Information Services Department, 2023, O'Brien, N.D) Hong Kong should take this good chance to be smart city based on development of China to have a better planning on energy, waste, land and space management in a controllable and to be a most livable city in the world. (HKTDC, 2020, KPMG, 2020)

Smart building Technology (SBT) is one of the methods used in smart city. SBT had been used since 2015 which is not widespread in Hong Kong (BusinessFocus, 2020) Now it is time to reap and not to fall behind to line up with the world trend. (Fitzpatrick et al., 2023, Sino, n.d., Sun, 2023)

1.1 Background

Technology stepped faster in the pandemic to ease the difficulties, there are changes in consumer behavior and experience. Digital Connectivity of Hong Kong residents are increasing in all aspects, in daily communication, entertainment, online purchasing and other associated activities. Social media and online platform squeezed into the daily life of humans. Miah et al., (2022) mentioned humans stay home to discount the way of the virus spread and the lockdown as social distancing, so humans turned to the internet to fulfil their needs. Streaming services have become more popular and increase the importance of online platforms and the use of internet (Valaskova and Durana and Adamko, 2021) It can also show the technology literacies are high and the importance of the digitalization and mobile are increasing. The below figure showing the different internet usage over past 12 months in 2022 aged 10 or above. (Census and Department of Statistics, 2021) It shows the importance of using technology to communicate in 24% and information searching in 23%. It revealed the technology and the internet had become the important part supported our life.

Figure 1.1a Data for internet Users 10+ Years old in the past 12 Months, Categorized^{c3}



Source: Constructed by the Author

More importantly, the Technology 4.0 revolution has quietly begun to take off. the lockdown and social distancing encourage the development. (Sino, n.d.) The contactless button with the automatic doors is the hit equipments during the pandemic decrease the spread of virus. The Property Technology (Proptech) has become the major

important issue that the government will put on effort. (Anderson, 2022) There are listed in the development plan. (The Hong Kong Housing Society, 2023, KPMG, 2020) Smart building and smart cities are in trend of the world. (Hayes, 2023) It had been used for years in some developed countries. With the rising use of different technology over the cities during the COVID time, all industries are adopting the change, the sunrise industry also should be change.

There are 759 licensed property management companies with more than 13,000 participators (PMSA, n.d.) And Protech had been hit topic that mentioned in last three years. The implementation is in trial, and it is not practical in use over the industry. (JLL Hong Kong, n.d.) The leading property management companies had developed their own innovative technology to catch the trend and launched their own applications to public. (Sino, n.d., HHH, n.d. Chow, 2018) Even the process had been affected like press a pause during the pandemic, but it steps silently into the stage in late 2021. As this trend sweeps across the entire industry, approximately 41,000 private buildings in Hong Kong have become prime targets, and competition in the market is fierce. (Home Affairs Department, n.d.)

HHH is one of Hong Kong's leading local property management companies and one of the whole owned subsidiaries of a large land developer. (HHH, n.d.) The buildings of the land developers will be appointed to its subsidiary to manage, which is the Unique Selling Point (USP). Although HHH holds only 4.7% of private buildings in the sector, HHH will continue have more appointed newly developed buildings by land developers. (Hong Kong Green Building Council, 2023) HHH can adopt this also in all its residential buildings that really increase its influence in overall industry. HHH has the leading status in industry since 2017. (HHH, 2020, The Standard, 2020, SHKP, 2019) SBT has been used extensively in new commercial buildings and several large residential buildings in its portfolio. Among them, a residential building managed by HHH near Wetland has been successfully completed. (星島日報, 2023, SHKP, 2021, HHH, 2023b) It had been a selling point of the site and a gimmie to the trendy residents.

Figure 1.1b Pictures shows the current use of SBT used in building near Wetland



As HHH had been the periodic successful which leading the industry in 2015, and it could be the contributor to the industry. However, the pandemic and the change of the human behavior made the difference. The use of technology to improve the quality of human life and it is raising its importance. Look over the industry, other property management companies keeping the effort to catch the chance. (Urban Group, n.d., The Henderson, 2022., Swire Properties, 2022, 1O1O, n.d., Kai Shing Management Services Limited, n.d., Sino, n.d.) If HHH may not improve and change, there will be another dead that will fall into the 'Trap of success' and the 'Death Spiral, which will not contribute anything. (David et al,1995) Lock in the illusion of initial success through arrogance and complacency, disability in new learning and focus solely on internal processes. It results in less focus on the customer, leading to increased costs and duplication. Thus, less innovation and decreases performance will made HHH fall behind the trend. Now, it might be one of the HHH path that left behind in the industry.

The newly implantation of the smart home demonstrates the acts are workable in the operations in decrease cost, energy management, provide better services, increase in security level, etc. (Sino, n.d., HHH, n.d.) Proptech had been used in other countries for years and leading the trend of the industry. VR is used to replace the site visit. (House730, n.d., Sing Tao Daily, 2020, Abualzolof, 2022, Centaline Property, n. d.) It is not an only idea but also affecting the whole industry and it is practical and works in the building.

The newly built buildings which have better planning at the very beginning. With the successful experience in the building near Wetland, there is possible and feasible to carry out the SBT. Based the change of the behavior of citizens in post-covid era and the increasing importance of the digital connectivity, it is believed that the spread of using SBT in all portfolio buildings will bring HHH to new height and will influence the industry. HHH is believed to reap a high level and leading the industry again. These will be discussed in Chapter 1.2.

1.2 Research Drivers

Technology maturity and the shortage of staffs are the key drivers for the HHH and the industry to use SBT. There is need to change and conduct the research. This research will investigate the need to change.

1.2.1 Technology mature.

Technology changed our world which became part of our daily life. (Mekky, 2022, Wong, 2023, Morgan, 2021) Lam (2021) stated to keep the competitive parts in leading role, the widely-use of the use of SBT is necessarily. Sanderson and Read (2020) stated that provide better customer services is one of the ways to increase the image of the value-added service made by the company. Thus, increase the brand image and the market shares over the industry. (Crown, 2021) Digitalization is widely used for all the industry to reduce the face-to-face interactions during COVID-19. (Neiman, 2021, Fabius et al, 2020, Criniti IV, 2020, Dartnell, 2022, McKinsey & Company, 2020)

These are equipping people able to use and familiar with the technology in all aspects. These are also used to reduce the shortage of labour. Thus, the use of SBT should be speed up. (Lee et al, 2024)

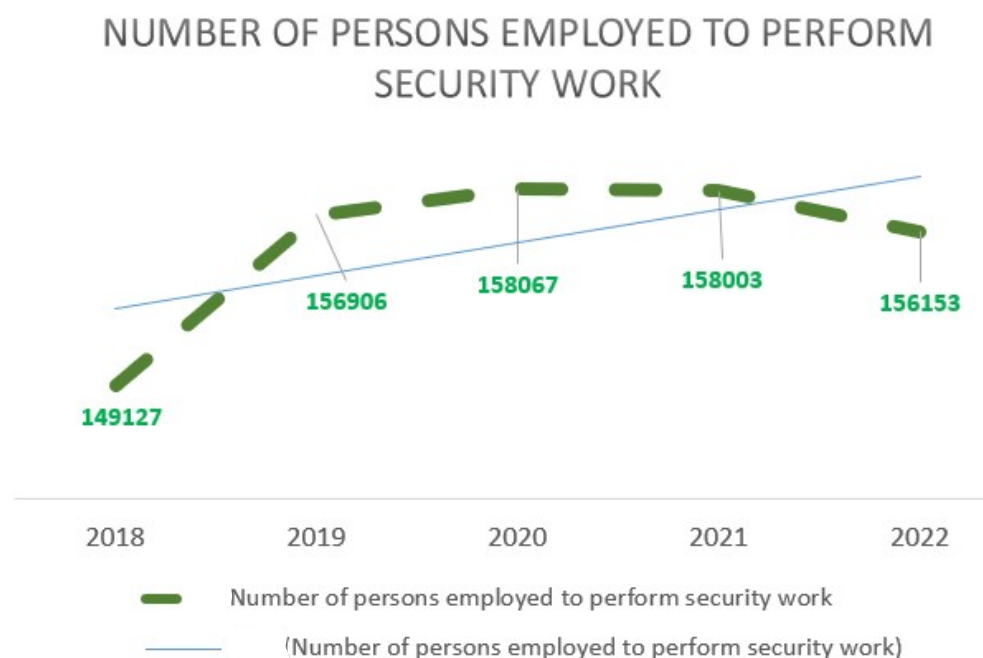
Proptech 3.0 had been used over years and there are enhancement work for the industry in Build4Asia for years. (Build4Asia, 2023) It is supported by the government. (ProptechHK, 2023, HKSTP, 2017) The technology had been matured and the new start-up had been supporting to the industry. (The Hong Kong Institute of Housing, 2023a, Hong Kong proptech association, n.d.) Most of the leading property management already developed their own system used over their portfolios. Other than HHH, one of the MNC also developed the biggest SBT connection to the command center over its portfolios in Hong Kong. (JLL Hong Kong, n.d.) The use of SBT is not the minority to use which is more mature now and it is the main stream to use over the industry

1.2.2 Shortage of labour

According to Report, including the margin for vacancy rate of private apartments, the total housing demand in the next 10 years will be 421,000 units, so the government has set a supply target of 430,000 units, which will increase the demand for housing security positions. (Housing Bureau, 2022)

Traditionally, property management is an industry that reply heavily human. (Li, n.d.) For the roles required 24*7 in operations in nature, there are a need of huge demand in the human supply even in the extreme weather to protect the human and the property of their buildings. (The Hong Kong Institute of Housing, 2023b) The needs of the ever response positions for the buildings resulted. As revealed in Censes, the number of working populations of this industry shared 3.5% of the total working population. (Census and Department of Statistics, 2023) Referring to the figure below, the trend employed security guard is increasing, it shows the demand for the posts are still demanding.

Figure 1.2a Number of persons employed to perform security work⁴³



Source: Constructed by the Author

PM is the one of the services sectors in Hong Kong and it is now a sunrise industry that will keep demand as the properties in Hong Kong needs to be managed. The main

generated jobs are security guards. The posts typically have 2 or 3 shifts and shared over 80% and contributed mainly to the industry.

However, the turnover rate is quite high in the industry. (HKSAR, 2023) The shortage of the headcounts are the evergreen problems of this industry. In last 3 years, waves of emigration seriously affected to every industry in Hong Kong. There had been a problem that noticed by the government and try to have solutions. (Liu, 2023) There is shortage in human markets, especially the frontline security, cleaners, technicians, customer services. Thus, it became more difficult to recruit the staffs for normal operations. (Li, 2023)

1.2.2.1 Difficulty in recruitment

According to the recent report released from Vocational Technical Council (VTC), the vacancy rate of the industry was 5.7% which is 1.3% higher than previous year and over 60% of the employers encountered difficulties due to labor shortages. The staffs can re-arrange to obtain normal operations, but recruit staffs are the major difficulties in operation. (Vocational Training Council, 2023) There have been long-term manpower shortages and recruitment difficulties in the industry. And the average income normally below \$15,000 - \$20,000 which required long working hours in normally 9 to 12 hours a day with statues holiday only. And there is low status in these posts in public with low income and low skills.

Besides, the waves of emigration added pressure to the shortage of the difficulty in the labour shortage in security guard posts. (Yiu, 2023, HKSAR,2023) According to the survey of Hong Kong General Chamber of Commerce, “Disappearance” of Middle-Aged Workers aged from 30 to 39 and 40 to 49 are the two dominant groups that leaving Hong Kong. (HKGCC, 2022) And the suggestion of the survey is to go automation and digitalization. As revealed in Cense, the net movement of population are serious in 2020, 2021 and 2022 which affecting the population growth over the years showed in the below figure. In 2020, there is 103% in net movement to the population growth while it became higher as 115% in 2021. (Census and Statistics Department, 2023) It is excluded in the number of death and Inflow of One-way Permit holders. It also reported 112% in 2022. It showed the impact of the waves of emigration affected the population and the working force are shrinking. This will greatly impact to the industry.

Figure 1.2b Population Growth by Component

Population Growth by Component			
	Net movement	Population growth	The rate Net Movement to the Population growth
	('000)	('000)	(%)
	Net movement of others	Total	Total
Year			
2018	24.2	72.8	33%
2019	-10.1	32.9	-31%
2020	-96.4	-93.9	103%
2021	-28.9	-25.1	115%
2022	79.4	71.0	112%

Source: Constructed by the Author

1.2.2.2 High turnover rate

From the report, there are 38,356 in 32.4% resignation rate over the posts of security guard or technician category is relatively high compared to supervisory and managerial level. Turnover rate of this category is 13.2 % counted over the number of resignations minus new hire compared to the number of the posts. The rate is higher than another category. The reasons that difficult to hire because of the long working hours, low status and required in shifts. To tackle with this issue, the company will usually source-out the posts of the guards, which will lead to a higher cost. rage the existing staffs and their morale, so the turnover rate is quite high. . (Vocational Training Council, 2023)

And there are quicker way and easy to earn money to work as part-time as the higher cash income., And it will also affect the intention of the talents to apply for the full-time posts instead of the outsourcing company. The switching cost is relatively low and less comparative than work as part-time employees as there are less responsibilities and more balanced life and control by their own as the shifts may varied from day to day. It also reducing low job loyalty. The higher wages bringing from part-time jobs outsourced for the same posts. it is a common phenomenon of the current industry.

. (Vocational Training Council, 2023)

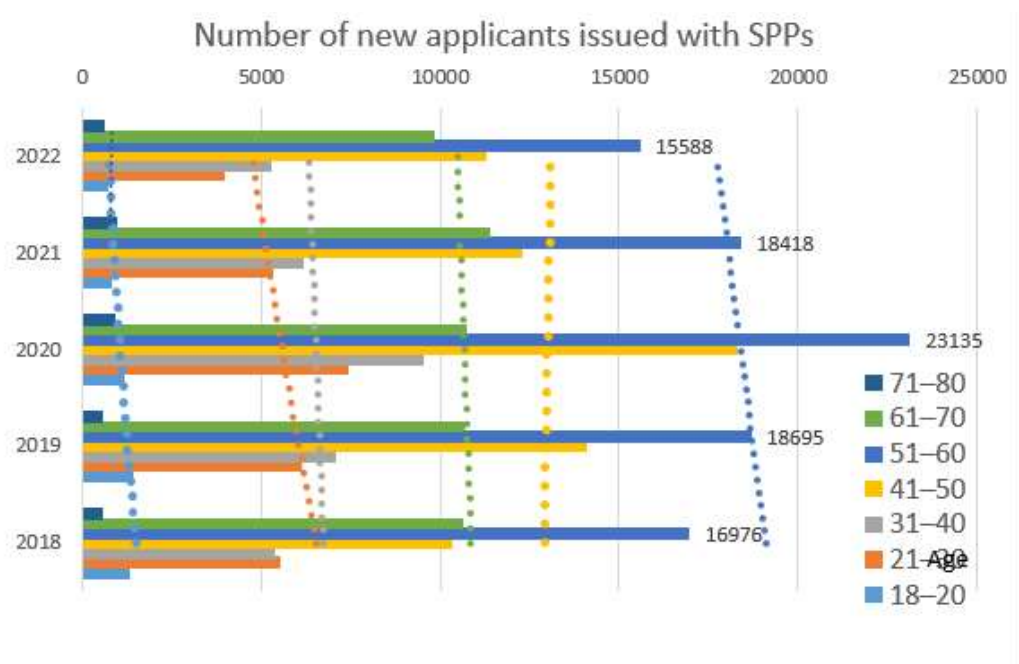
1.2.2.3 Aging labour force

Based on Population Projections, aging population is the common trend of Hong Kong. It shows that the number of elderly people in Hong Kong is expected to almost doubled

in 20 years, to 1.2 million people in 2039 covering 2.52 million people (33.3%). (Census and Statistics Department, 2020) An aging workforce remains a major challenge for the human market. (HKSAR Press Release, 2024)

Revealed by the Hong Kong Police Force (HKPF), more than 50% of the new applications of the Security Personal Permit (SPP) are aged over 50. For the qualifications of granting to be security only required a certificate of two days training. So, it does not require high education background and other techniques needed. The average education level below secondary 3. From the records of the HKPF, the trend of the new holder of SPP, there are relatively high in the age of 41 or above when compared the young adult. The light orange dotted line showed the trend of aged 41-50 to obtain SPP is increasing as compared to the trend of other age group is decrease. It showed the low requirements and the supply of the posts, there are increase in the new application of the SPP. (HKSAR Press Release, 2023)

Figure 1.2c Number of new applicants issued with SPP



Source: Constructed by the Author

1.2.2.4 Changing job expectations.

Gen Z does not have job loyalty to one job with long working hours which have no freedom in not in hybrid mode (Deloitte, 2022) The new working force will not have a job loyalty than those baby boomers. A more balanced life and freedom will be the

importance priority that the new working force. It showed there are no attractive to young generation to be security guard. Long working hours and mandatory shift duty that cannot control by the staffs. In the new research of manpower and the behavior changed during pandemic, the human capital required a work-life balance and a hybrid mode. It is a new trend that changes the priority to choose a job. As people tends to have a more balanced life and concern on the mental health. So, it is less attractive to the people to choose the security guard post. And there will be a serious shortage of position of the required roles. (Manpower Group, 2024a)

At a result, the development of the technology in mature stage and the technology literacy of citizens are the first driver of the change. And the serious shortage of necessarily posts of the industry will be the problem. It is necessarily to outsource which is more expensive. Thus, the costs of operations costs are increasing. There is a need to tackle and face this issue of shortage of security guards. This is another driver that should move on.

As discussed above, there are urgency for HHH to keep using and spread the use of SBT. the maturity of the SBT and the shortage of the security guard posts the use of SBT is nature, and it is a need to cope with the trend which will not fall behind. And the continues shortage of the necessary posts for security guards will results poor services quality of the property management and may lead to risk of dangerous.

1.3 Research Objective

SBT is not new and is used in commercial buildings. (Kejriwal and Mahajan, 2019) These had been accepted by those working force. However, the population living in residential area is varied from young to ‘sliver-hair’ who need to be more assistance. SBT is a new change of their daily life as means of security. There should be an obstacle to overcome and a transition time to use. The factors of the resistance should be discovered before the spread of SBT.

In addition, in the post-epidemic era, digitalization is changing the world. Real estate is also changing in various aspects which bring cost-saving. (Lee et al, 2024) The government’s blueprint in smart cities is also mentioned. As an important and

responsible service industry in Hong Kong, the promotion of SBT should be implemented as soon as possible.

Mastercard Economics Institute (2023) stated the personalized customer services is influencing the services sector. A customized, reliable, and responsive will improved the customer experience which is importance. In the successful case near wetland, SBT will also help. (SHKP, 2017) Dhruw and Sainy (2023) mentioned the timely and effective to handle customer inquiries and complaints can ensure customer satisfaction and maintain corporate reputation in an efficient system.

In conclusion, this study aimed to identify and evaluate the factors that influence the use of SBT among residents in buildings. It is to find out the obstacles that hinder to use of SBT. The study aims to investigate different factors crucial to affect in the promotion in the use SBT in the non-digitalized residential buildings in HHH.

1.4 Research Question

SBT is the trend in PM which is the new trend in the world. When residents choose to use SBT that relate to their daily life. When accept to use the of SBT, residents will concern on the four main factors: (1) security issues of the use of SBT (2) costs of the use of SBT, (3) Convenience or the level of user- friendly, and (4) reliability of the use of SBT. These factors have been identified in previous studies and can influence the decision of the humans to use. There will be more detailed discussion in Literature Review in Chapter 2.

The research is based on the following questions and will be answered in the research.

1. To find out how security impacts the use intention of customer on SBT ↵
2. To find out the importance of costs influence residents on the acceptance of use of SBT↵
3. To find out the relationship between convenience and the use intention on SBT↵
4. To find out the importance of reliability to use SBT↵

Survey distribution to the public for data collection on willingness and any potential correlations or relationships between various variables of using SBT. (University of Southern California, 2024) The aim was to identify the main antecedents and

consequences of intentions to use SBT. A comprehensive questionnaire collects the necessary quantitative data and performs relationship analysis on the data. Strategies will be developed to increase the use of SBT in HHH buildings.

1.5 Value of research

Pandemic has increased people's heavily reliance on digital connection on entertainment, shopping, and socializing (Donthu and Gustafson, 2020). The epidemic has had a profound impact on people's lives. The lifestyles, work arrangements, and social interactions have undergone fundamental changes (Alah et al, 2022).

Among the public surveys, the aim is to investigate the factors that influence usage intention. The aim is to identify basic determinants and understand the resistance to use of residents' intentions.

Through analyzed data, valuable insights to help industry better to meet the needs of resident's preferences on SBT's use. Research showed that there is a connection between security and cost that influence SBT usage intention preferences. PMs should consider data analysis when designing strategies increase usage intent. In the era of Industrial Revolution 4.0 and PropTech 3.0, SBT is a must-have item for PMs amid fierce competition. These findings are noteworthy and trustworthy for the PM and should be taken seriously be considered in future decision-making processes. Recommendations can then be provided to the PM to improve its safety, cost, convenience, and reliability to increase residents' willingness to use it.

The innovative image with more than 50 years enviable experience with its USP. Differentiation strategy should be implemented to stand out (Porter, 2004). Otherwise, the image of HHH will fade out in the mainstream. To outstanding the motto of HHH, to provide the commitment in "Building Homes with Heart" in the heartfelt memorable experience for consumers. (HHH, n.d.) It will increase customer satisfactions of customers by the value-added services. (Dhruw and Sainy (2023)

Since HHH owns 67% of Gross Floor Area in residential areas, it will be a great improvement for SBT usage and customer experience. Therefore, the research will

provide useful and reliable information in line with its vision and expand its brand to continue its pioneering image.

As an industry practitioner, I also learned from this topic that Hong Kong's approach is far behind the world trend. But it was discovered that preparations for the next milestone in Hong Kong's development are well underway. Before researching, I thought it was just business policy without solid idea to complete the project. Practitioners were just achieving the KPI of the use SBT without any motivation.

With the support of the government, a big step has indeed been taken. I am glad that I am also involved in research and industry, and my horizons have been broadened.

1.6 Chapter Arrangement and Main Description

The structure will be present as follows:

Chapter	
One	It consists of the background, the drivers in terms of problems, issues and reasons to change, the research questions and objectives, with the structure illustration.
Two:	The review of literatures on relevant information mentioned and used in this research. This will be showing the evidence to the variables. With the variables, research framework and the hypothesis are developed.
Three:	It presents the research methodology and the framework on the variables and illustrates the hypotheses. The way to collect the data, sampling procedures and the data analysis method will be show in this part. The research design (Primary and secondary), assumptions and philosophies, strategies, and limitations will be also discussed here. Other than this, Th grant chart will be used to show the flow and timeline of the whole research to ensure the survey is reliable under validity.
Four:	It is to reveal the results of the responses and have further discussion on the relationship of each variable to the intentions to use SBT. Based on the primary data and secondary data, analyzed will be performed in reliability and correlation and regression analysis. information will turn into the results and provides evidence to the study objectives on the positive or negatives on the hypothesis.
Final	It will be drawing conclusion and recommendation to HHH based on the analysis and the hypothesis established in Chapter 1. Suggestions and recommendations will be given to HHH in the possibility of the spread of the use of SBT. Limitations will also be mentioned in this part.

Chapter 2 Literature Review

This part will determine the definitions of the terms used in the study. And there will be the supporting evidence to proof that.

2.1 Research Focus Areas: Explanation and Discussion of Variables

As continues to develop, different asset types, scales and functions become increasingly complex and diverse, and people's expectations to change the industry of PM services continue to increase its importance in the society. PM is a profession industry that governance by “Property Management Services Regulations (Article 626) divided into seven categories: General management services (e.g. Cleaning, Security, Carpark management, Shuttle bus service) Management of the environment, Repair, maintenance and improvement (e.g. Landscaping,) Finance and asset management, Facility management, Human resources management, and the legal services range is wide, serving private residences, public housing, shopping malls, offices, clubs, etc. (PMSA, n.d.)

In the pandemic time, as per the restrictions of the physical movement and social distancing without physical touches, leading to a surge in demand for contactless devices and the remote-control methods in all buildings, especially in residential area. (The Hong Kong Institute of Housing, 2023c) And the needs of using online and non-physical reactions by technology are increasing. (Sing Tao Daily, 2020)

As a result, the use of SBT had been exposing to the market. The pandemic caused a surge in demand for the contactless devices and technology. The raising use of technology as our daily life. (Mekky, 2022, Kemp, 2024) Trust is essential in success to use. Security and cost and convenience are crucial factors in use intention. This helps them stay competitive. . (Vocational Training Council, 2023)

2.1.1 Smart Building Technology (SBT)

Digitalization is growing importance to the PM industry. The rapid development of technology has transformed the way people live and work in urban areas. Smart buildings have a positive relationship with smart city, so the main goals of smart buildings now.

One of the emerging trends is the use of technology applications inside the buildings, such as smart home devices, online booking systems, digital payment platforms etc. These applications are often provided by the PM companies that operate and maintain the buildings. The concept of smart buildings was first introduced in office buildings in the United States in the early 1980s, with the goal of energy saving and productivity increasing. (Hoy, 2016) This concept was later applied to residential buildings to provide residents with a more comfortable life. "Smart building" is commonly used as term to describe homes that controls centralized to integrate the overall home automation systems.

The term "smart building" began to be used to describe a variety of technologies and make heavy use of electronic products and are closely related to telecommunications technology that contains many things not limited to data collection from user devices, sensors, systems, and services within the building. (Cisco, 2023) This is a very board in meaning. As it is also in terms of using intellectual technology, so there is another term as "intelligent building". Someone mentioned these two terms are the same thing while Smart building is the progress of construction technology from "manual" to "simple", "automated", "intelligent" and "intelligent". In Intelligent building, Lighting and air conditioning can be manually controlled by residents when they need in the controller. The automated building using timers and central controls, lighting, and air conditioning controls on and off according to a schedule. In Smart Buildings, it will combine the advantages of automated function and turned into simple to users. The system will still be controlled automatically, in dynamically adjust to the needs of its users by the previous patterns. Smart Building are run according from its collect data from the sensors and camera. (Hoy, 2016) Besides, it can be tracked in the history of the usage not only in peak usage times. The data can also use for predictions. Building Management Systems (BMS) are now used by the PM to oversee the overall data of the buildings in energy, humidity, and temperature, lift and other machinery usage, air quality, water quality, etc. With these overall monitoring, energy and solar energy usage can be control and predict.

Concepts used in residential building can be found in the concept of smart homes where devices are connected, such as energy management and monitoring in power control,

security and safety, well-being and health support, entertainment, communications, and Comfort. Sony, Samsung, Apple, and Xiaomi will continue to launch these products. These will foster the development of smart building.

Fisk (2001) defines the original smart home is a place where users install and control new technologies using appliances like smart TVs, doorbells, lighting, and speakers, sensors, actuators, and switches in such equipment. Gann, Barlow, and Venables (1999) stated that the main purpose is to improve comfort for people, by medical support providing and controlling, monitoring the mobility and safety, and provide today's therapeutic services. Chan et al (2020) stated its functions may vary from the characteristics and circumstances of users. Fisk (2001) listed the main functions of a joint intelligence system in control panels, emergency support, water and energy monitoring systems, automatic lighting, security doors, window blinds and temperature control, etc. As used by the parents at home, there are also the CCTV to monitor their kids or pets or even the maids at home. Or to monitor and to control the access to their homes and lift access and surveillance system their home. These are also can be defined as smart home technology in this research.

As the technology advert, the concepts of smart home moved to smart building. The BMS also changed not only control in air-conditioning systems, but also the lift, the window blinds, the whole building security CCTV surveillance, and entrance doors. It is not just stay inside one's unit. Smart buildings are not a new concept in property management and have been implemented abroad for decades. (Kejriwal and Mahajan, 2019, O'Brien, N.D, Deloitte China, 2020)

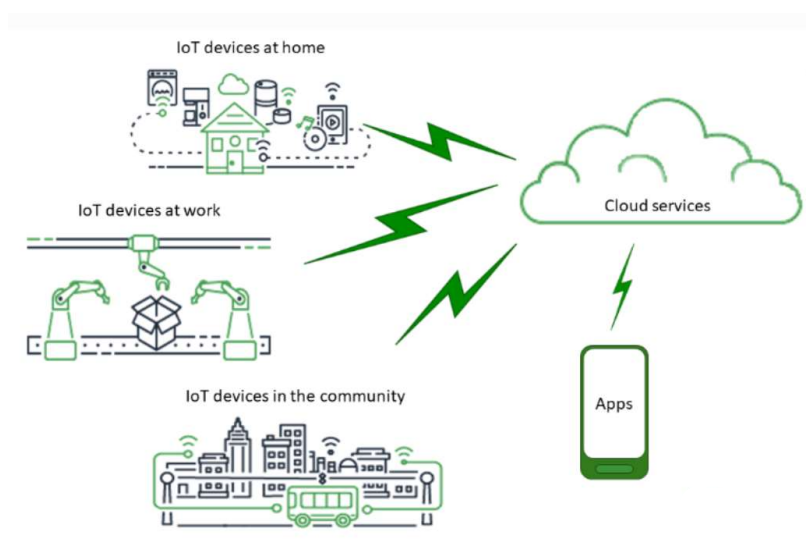
For instance, there are also the water sensors and smoke detectors for home users to connected to their smartphones or other devices to check and oversee the situations of avoiding the risk of leakage. There are changed during the pandemic time especially to control the surveillance system online or at a designed platform, UV lights filtration, touchless entry, and automated sanitization measures.

The Internet of Things (IoT) is also used in SBT, which is a very important part of driving SBT. Smart buildings leverage IOT connectivity and power systems to provide efficiency and data improvement. The connected systems may include access control

systems, IP video camera systems, smart meters, smart parking, and/or connected IoT devices and sensors. (Beevor, 2020) Information and Communication Technology (ICT) are the ability that the data transmission to provide real-time and efficient information ICT which is key enabler in the development of smart city. (HKTDC, 2020) This also affected by the city's advanced ICT in connectivity of fiber optics, high-speed broadband networks, city-wide Wi-Fi networks and 5G wireless network, connected IoT devices and sensors. (Sadikoglu-Asan, 2020) As 5G technology had been developed over Hong Kong, which is the essential support of IOT, it is critical area to become smart as connectivity is the foundational layer of all technology. (KPMG, 2020) The ultra-high speed, with massive connectivity increase the unlimited possibilities in smart cities among in constructions, buildings. As smart city vision, more enhancements in digitalized solutions in AI-based analytics, IoT sensors, , and mobile edge computing, will be a critical to live up the new wave of innovations. (KPMG, 2020)

Internet of Things (IoT) applications are becoming more prevalent in the property management industry, especially in Hong Kong where the demand for smart living solutions is high. (Baum, n.d.) The applications IoT applications can provide various benefits for residents, such as enhancing security, convenience, comfort, and energy efficiency. However, there are also some factors that may affect the adoption and satisfaction of residents using IoT applications of PM companies in Hong Kong. (Abdulrahman and Duha and Victor, 2020)

Figure 2.1a Flow of IOT



Source: Amazon⁴

It works as a suite of technologies and application of connecting physical devices as sensors and locations to transfer data to an online central platform and to gather in information and instant data analysis within the big data to give the final smart” action to the users by utilize the ICT as backbone to communicate data and other attributes. (Kejriwal and Mahajan, 2019, Amazon, n.d.) Using RFID technology, facial recognition, Optical character recognition (ORC) recognition, AI technology, Machine learning (ML), Natural Language Processing (NLP), Robotics are also used in new smart building applications. (Beevor, 2020, Atha et al.,2020) The use of RFID used as the smart card or resident’s cards to wave at the sensors for confirmation to enter the building and facial recognition are the raising method used in smartphones. (IoT Projects Ideas, 2022) With the confirmation, the door will be instructed to open with the sensors automatically. This kind of method used already in the newly builds commercial buildings. (Kejriwal and Mahajan, 2019))

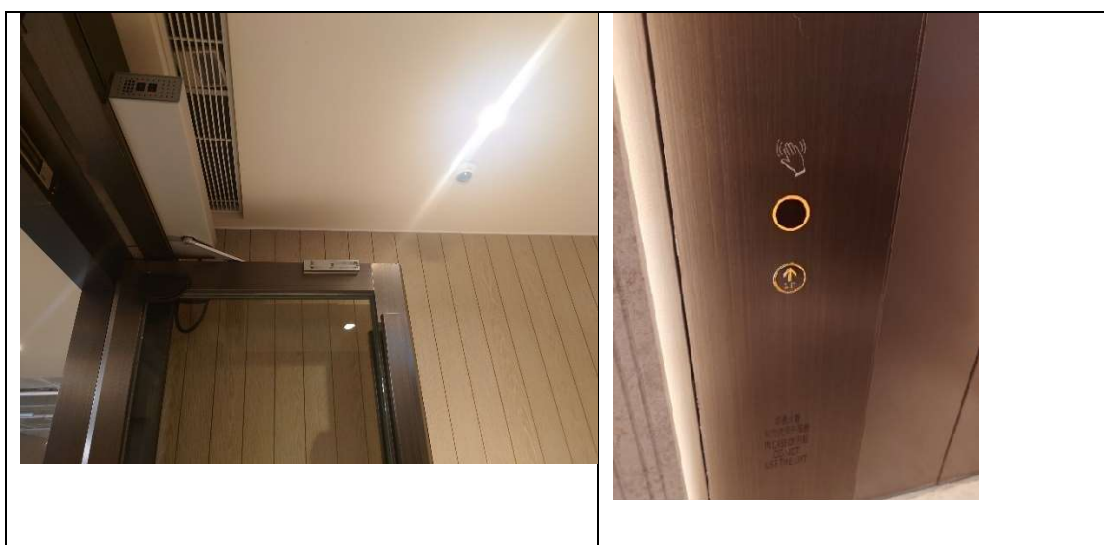
During the pandemic time, there were increased installations and increase the awareness of the touchless buttons or automatic doors because of the hygiene reasons. Besides, this also used in lift control system, the toilet or other entrance access. (Groote and Volt and Bean, n.d.) The IOT and the Proptech are very common in China and had been used for many years. The industry of Proptech are very keen competitions. The concept of smart cities has penetrated every aspect of daily life. NLP, ML and AI technologies are still under development but are already being used in hotlines and instant messaging tools to serve customers faster. And use ML to process it in the data pool and respond to it by AI. (Amazon, n.d.) It had been widely using in China and in US counties. The use and ORC recognition had been used in the carpark of the main land developer and it has been using together in the membership to deduct the carpark fee in the linked account. (SHKP, n.d.) Meanwhile, all technology will use used as a combination in smart building applications in this research. The use of the technology is not the part to discuss.

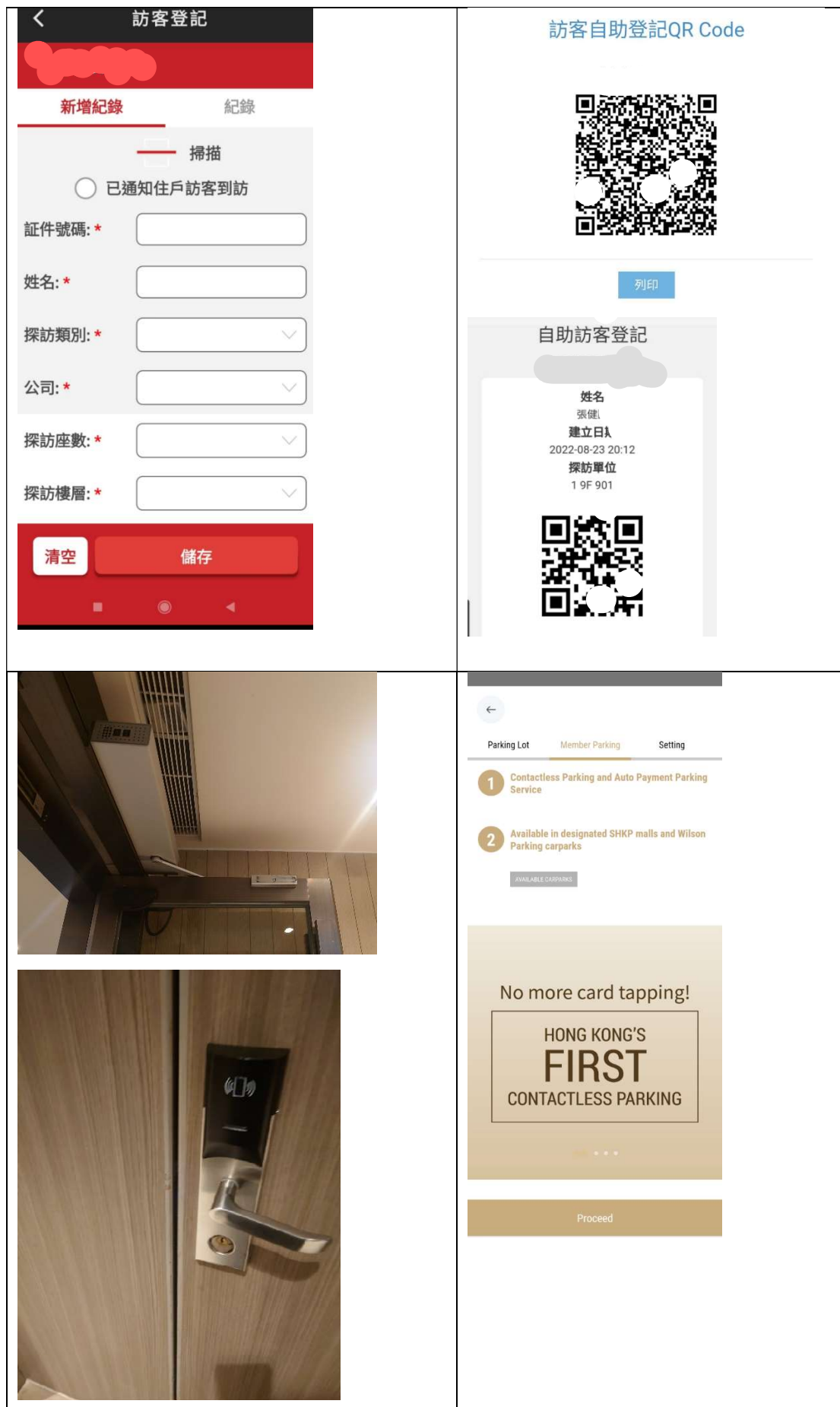
As review in Global Proptech Survey, the main reasons for using Proptech is to improve efficiencies, cost reduction and help in decision making. After the implementation, efficiencies improved, and decision making, as well as Revenue maximization result instead of just cost reductions. (Grunewald, and Pyle and Weir, 2019) It shows the use of SBT has many benefits. In KPMG (2020), there are also mentioned about the waste

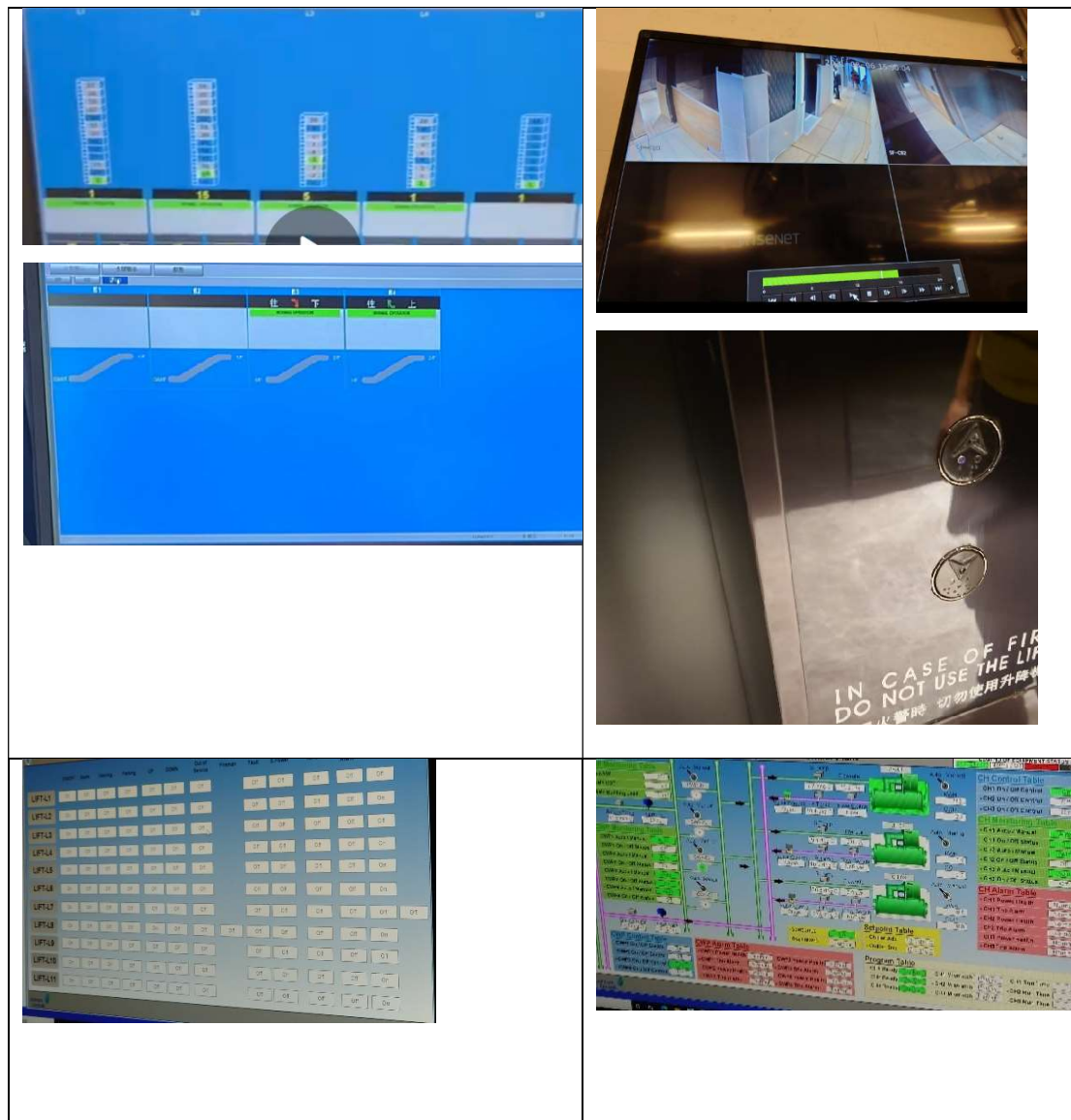
and energy management in the next planning of our city as it also would be the sustainability of our city and benefit to the planet. Thus, costs will be reduced which will make the city become more livable and sustainable.

The use of IOT and other technology are listed as Proptech and these can be all mentioned in SBT in this essay. The use of SBT is widely adopted in commercial and some of the newly built buildings. To increase the overall control of the buildings, various areas are using the BMS in MVAC systems, lift control systems, air analysis systems, access control systems, CCTV systems, etc. connected with a main control system through IOT technology and an ICT connection. The applications are not limited to the following. SBT is an innovative technology that uses facial recognition to screen residents and employees, use access cards or tag keys or mobile applications instead of self-opening doors with the keys, reducing the risk of unauthorized entry into buildings through contactless automatic door. Use of automatic reader by the OCR scanner at the barrier gate to enter the parking lot without any manual functions, to enter the permitted area. instant surveillance system through online platform and the public area can easier control of the entry. Besides, the normal functions of the smart home can also apply in this part. Management of rental or other expense information can also update and manage customer relationship accounts. Reservation of club services and energy usage recorded, the latest government and news of the buildings also be checked instantly, (The Hong Kong Institute of Housing (2023a)

Figure 2.1b Pictures shows the current use of SBT used in building ↩







Normal visitor registration, which was originally carried out by security manually based on physical records. It can now be self-registered through QR codes generated by the occupants or self-entered information. It will be more Convenience for visitors and safer for the building's occupants which increase the satisfaction of owners (SHKP, 2021).

2.1.2 Security

As SBT is the advanced technology based on the connection of the internet, it is also using the virtual connection which will easily attacked by hackers, broken, or affected by the electricity supply. There are literatures reviewed the relationship between the privacy and security affected the use of IOT and SBT. (Omolar et al, 2022, Schomakers and Lidynia and Ziefle, 2021, Xu and Wang, 2022).

Security can be defined as two different meaning in this essay. The first one is cybersecurity means personal and organizational systems, applications, computing devices, sensitive data are protected from attacks, and someone attempted disclosed. (IBM, n.d, Gillis, 2023) It is the overall physical protection of the buildings away from the risk of letting those non-residents or anonymous that will risk to the property. (香港經濟日報 HKET , 2016)

Schuster and Habibipour (2022) indicated people about afraid of security and privacy which had been violation and abuse, and do not believe in the product security or maintaining privacy. Not half of SBT's potential users trust on manufacturers and service providers or government provide information in these areas, so this is not the case Thus, privacy concerns is a major barrier to adopt SBT.

In Hong Kong, safety and personal interests are important topics of concern to citizens. (Office of the Privacy Commissioner for Personal Data, n.d, 香港經濟日報 HKET, 2016) For SBT, personal information, personal health, exercise, habits and privacy, tracking user behavior, facial expressions, etc. can easily be leaked to third parties, which will cause concerns about the loss of personal information. (Office of the Privacy Commissioner for Personal Data,2019) The data and details disclosed for a higher risk of any other incidents. Caso et al. (2023) stated the main obstacle that implemented the IOT is the cybersecurity which rated more than 30%. As long as the technology used in SBT are mixed with different technology. If ones try to attempt to another visit history, purchase record or other tracing records will be a big issue. HSBC HK (n.d.) stated social Engineering and cyber scams are very common after the spread of internet connection. People have a greater awareness on the personal information. Therefore, security is one of the common concerns using SBT especially in residential area. (Pal et al, 2021)

Grunewald, and Pyle and Weir (2019) mentioned of cyber security is still an issue for the smart building. There are more than two-thirds of respondents are either “quite confident” or “very confident” of their cyber security as there are precautionary in digital strategy in their organization, e.g. overall cyber maturity assessment,

system/building penetration testing, organization policy in business continuity management, supplier security risk, and investment in employee education for the secure.

Clearly, transparency in data collection and obtaining user consent at the time of opt-in/opt-out will increase user confidence. The second measure is to implement a comprehensive security policy through privacy by design and default principles. Third, data encryption and malware protection should be implemented. Finally, clear responsibilities are needed to develop common industry standards that are in line with global certification and branding systems. (Schuster and Habibipour, 2022, Saj and jun, 2023, Cichy and Salge and Kohli, 2021)

Improving user understanding of IoT privacy and security can have a positive impact on user trust in IoT. Subsequently, users' trust in IoT will affect their willingness to continue using IoT (Koochang et al,2022, Schomakers and Lidynia and Ziefle, 2021, Xu and Wang, 2022)

On the other hands, there are more secured when people using this as a defense tool. There are some public issues raised when choose to use the kind of SBT as its e security level based on the systematic setting. Other than the traditional way opening the doors with a security guard. (The Hong Kong Institute of Housing, 2023a) Many people mistakenly thought of the security means the job nature itself, however, it is not limit to the physical job. It protects the building from the risk of potential burglary or possible loss. (ProptechHK,2023, 香港經濟日報 HKET, 2016) Now, the concerns switched to network security, personal information security. (Daniel and M. and Fadi, 2018) SBT offers advanced features to monitor entry and exit to prevent misuse of authorized access. For example, control locks using real-time secure network by remote control. Loss of personal information when using the Service is also covered in the "Security" section.

PM increase its value-added service to provide all-round service through SBT. Other than to ensures the safety of properties and buildings which is original intention of PM. (Crown, 2021, Li, 2023, 香港經濟日報 HKET, 2016) By using with other technology

in big data, SBT supposed to perform better than human in protect and securing the buildings. (Surya,2019)

At a result, the security will be one of the key factors affect the use of use of SBT.

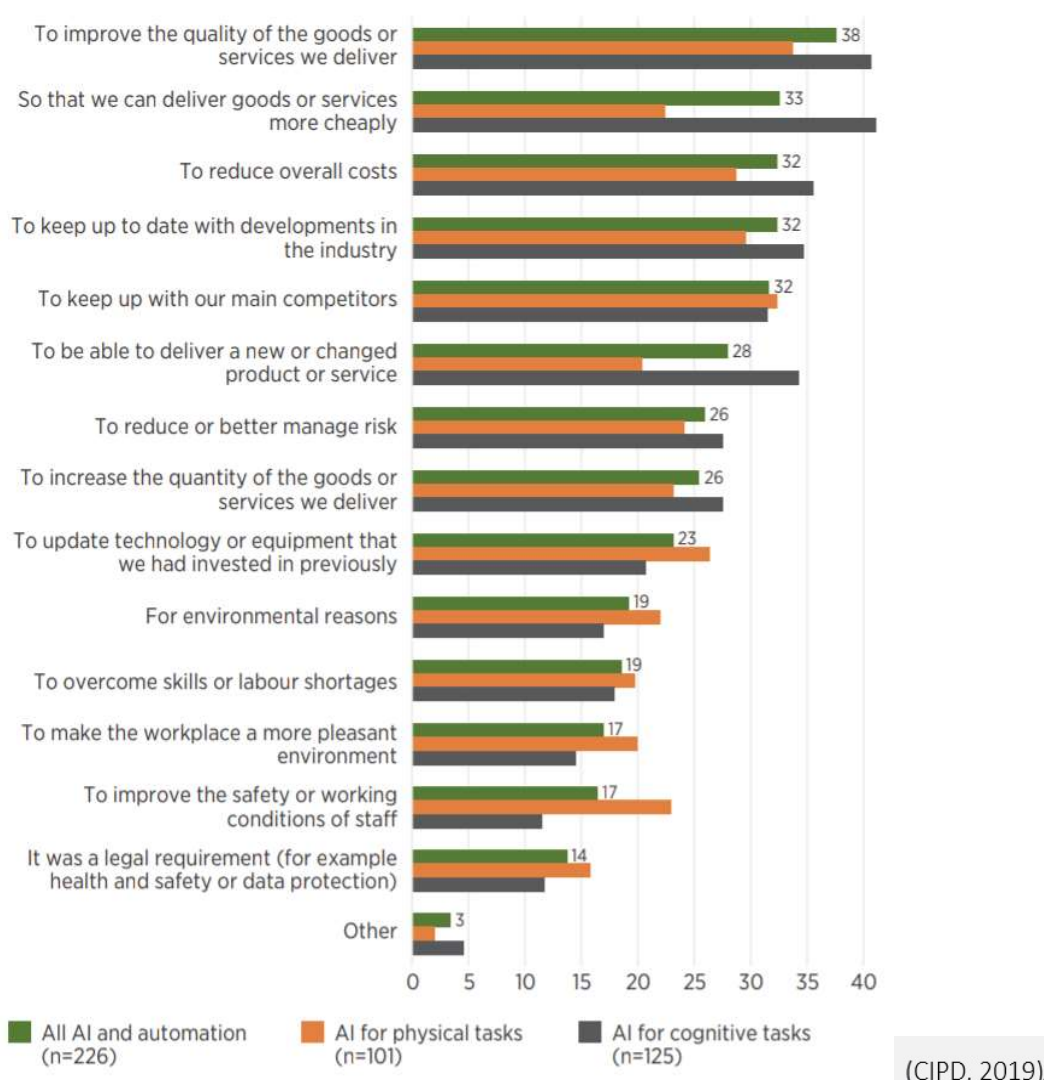
2.1.3 Cost

As labor costs of PM and frontline staff salaries increase and the average age of frontline employees increases, the challenge for the industry is that it is difficult to find reasonable ways to deal with money. Compared to high paid hours. Fixed-term . (Vocational Training Council, 2023) contracts lead to staff shortages and difficulties in recruiting (Hong Kong Institute of Housing Management, 2023).

The loss or the outflows of the immigration tide had been made the loss of human assets of all industry in Hong Kong, even those in Frontline staffs. (The Standard, 2022) And the Frontline staffs are important to the operations in PM. Based on reviews and other research, it is difficult to hire stable full-time employees for operational positions. The turnover rate in this industry is high compared to other industries even with a higher incentive of the package. . (Vocational Training Council, 2023)

As the average wages of the kind of posts is relatives low than the part time post, so there will be not much incentive for the frontline staffs to choose the full-time jobs. And the jobs are more similar, so the turnover rate will be high as there are low switching costs. So, the costs for the outsources security staffs are quite high in long run. Going digital is the common phenomenon of nowadays. Go green and streamlining the organizational structures with less paper and administrative works will also assist in cost control. There will be relationship between digitalization and staff's turnover in real estate. (Lee et al, 2024) AI and Chatbot support are commonly in all business in the reduction of the operational costs. (McKinsey & Company, 2020, Hall,2022) This will assist the industries to reduce the number of staffs in customer services which also allow 24*7 responses, that will be increase the customer experience. From CIPD (2019), go digital can reduce overall costs and improve customer services in the figure below.

Figure 2.1c Employers' reasons for investing in AI and automation (%)[←]



SBT helps users decrease in expenditures, increase maintaining efficiency, and reduce repair and replacement costs through extensive energy monitoring and control. (KPMG, 2020) HKT (n.d.) also launched the solutions for the PropTech for the PM. HKT mentioned about the benefits that SBT could lower the operation costs in various ways: to reduce electricity consumption by the smart lightings with sensors, the automatically adjusted temperatures, cooling, and ventilation within the building structure from the data, precautionary alerts and measures before the incidents or potentials risks come, reducing environmental impact by decrease in energy usage. The efficiency of the energy management use to optimization of the structured by reaching high-efficiency energy-saving clusters and peak shaving through BMS. (Groote and Volt and Bean, n.d.) Centralized data analytics will enable integrated shaving, optimized scheduling

and load balancing operations, benefiting smart cities and their customers. (Babar et al, 2021)

Reduce breakage and repair costs by monitoring equipment condition and notifying employees through sensors when defects need to be repaired. Additionally, temperatures can be automatically adjusted based on input data on occupancy patterns to optimize energy consumption. (Amin et al, 2017) To achieve effective energy-saving effects, it is necessary to improve the energy and cost savings of the building. (ProptechHK,2023) Salerno et al. (2021) revealed that with the SBT, the electricity bills and the energy usage decreased after monitoring as in a full picture of the usage. Besides, predictive maintenance reduces downtime and maintenance costs avoiding loss of income. It also extends the life of your equipment and reduces expensive replacement costs. (Valle, 2023) From the cases in China, there are effective costs control and energy control in smart buildings and city. (Atha et al.,2020)

While the settling cost of the smart home is not expensive. Throughout the whole industry, each company are keep innovating their own brand of technology to catch up the trend and to increase the market shares among the users. The initial set up cost will be solely count in the company development costs as it will use over all the company. The decrease in the demand of the security staffs will gradually decrease in management fee. (香港經濟日報 HKET, 2016)

2.1.4 Convenience

Mobile applications are common nowadays. The ease of use and convenience of all smart home applications is one of the main reasons for use. (The Hong Kong Institute of Housing, 2023c, Chang and Nam 2021) The report also revealed that use of technology assisted in the operations and ease the burden of shortage of labour in COVID-19. As it is used for Convenience the residents instead of stunning while using the applications. The original concept of smart home is to relief the burden and to simplify daily life and enhance convenience. If a smart home is not user-friendly, it becomes very time-consuming. This will increase the factors that resist use in the industrial revolution 4.0 era.

In the era of viral, online applications and the online devices are most important to our daily life. Kemp (2024) stated Hong Kong's Internet penetration rate reached 95.6% of the total population in early 2024. Internet connection is more important than ever before. People tends to technology in all aspects of life. The world changed the ways to receive the information. The network is becoming an important part of our lives, allowing us to stay connected, understand the situation and proactive. During the pandemic time, every business is gone viral and online by means of different tools. In the industry of retail, in catering, in education which needs face-to-face interactions also needed to change to online. (Nyberg, and Shaw and Zhu, 2021, The Hong Kong Institute of Housing, 2023c) Covid-19 had been the catalyst to the SBT. (Lee et al, 2024) A real-time camera can detect face masks, and temperature before the open access to the door to prevent, mitigate the from the spread of disease. The SBT will provide an instant and real-time control to the users and PM. (Varshini et al, 2021, Capris et al, 2022)

Under the new normal, humans are becoming more and more accepting of new technologies and new tools. During this time, tools and techniques become easier to use, are updated frequently, and become competitive. Convenience and user-friendliness are key when using new technology. (Mekky, 2022) This is an important factor in driving acceptance and usage among potential customers. The ease of use of interfaces for applications and technologies will influence how people use them. Time is money. If it takes time to figure out how to use it, it increases the proportion of people who refuse to use the app, which is not cost-effective. Humans are more aware of the importance of having reliable connections to be able to quickly understand the full picture of uncertainty over their duration (Scheinfeld et al., 2022)

Furthermore, Shuhaiber and Alkarbi and Almansoori (2023) revealed that people will be influenced by social networks to trust and use in SBT. After the pandemic, people are tending to be more aware of their health and concern on their own needs in life balance. The intention of use of SBT will be affected by the specific needs of different individuals. (Huber et al,2019) Mastercard Economics Institute (2023) mentioned people would like more personalized services in this era. With the increasing use of technology to ease life, instant responses and genuine customized service make everyone feel special. Johnson Controls (n.d.) mentioned the existence of the SBT is to

comfort and wellness without compromises based on the needs of the users which is more flexible. This idea matches with the current trends of the human that concerns on their well-being, more personalized services. Therefore, customers' expectations on smart home applications will make their lives increasingly easier drive them to adapt to new ways of using them. (Luo et al, 2023)

Change is not easy, and it should be a very strong reason for them which is more Convenience that helps their life.

2.1.5 Reliability

Technology is facilitating repetitive and dubious tasks for people. Technology can be used to get accurate results when calculating dumping and numerical work again. Administrative and clerical work can be transferred using SBT. (香港經濟日報 HKET , 2016) Humans can save time on work those decision making and other plans instead of engaging in low-level work (The Hong Kong Institute of Housing, 2023a)

HKTDC (2021) cited the recent dangerous works outside the buildings or cleaning the curtain wall had been replaced by the robotics instead of the cleaners endangered in the gondola. Works can be finished with exact and accurate results. The more scientific overall inspection on the leakage works combined with IOT connections will be assisting to the PM and users to oversee the whole pictures. This can also improve the efficiency of the spot out the origin of the leakage point instead of based on the experience of the PM.

Besides, the SBT are provides a service in a preventive measure which will greatly reduce the chances to have a sudden outbreak of incidents resulted in a high cost. The overall supervision of the situation of the whole buildings and stored as a data base and give an alert to PM or users if there are any suspicious. (SHKP, n.d., 香港經濟日報 HKET, 2016) Technology can do a on time and without another human intervention. For the human, the reliability of the smart home is a reason to choose based on the characteristics of the technology.

PropTech had been used in construction and property for a period. (Castro-Lacouture, 2023) Li and Poon (2013) mentioned the number of the incidents in construction are very high and the use of SBT will decrease the rate of the accidents. It is widely used in all parts of construction to provide detailed and perfect assumptions for large amounts of data that are repeatedly calculation. There is smart hamlet with the IOT connected systems are used nowadays to monitor the body conditions of the workers. And the hamlet will also restrict the workers to enter the dangerous areas. (SHKP, 2022)

There are also doubts about the reliability of the technology. Moore et al. (2020) demonstrated the reliability and employment opportunities associated with reliable data transfer. Without secure, appropriate data transfer, resource allocation, management, leasing, measurement, security, and reliability are all affected. (Kharchenko et al., 016) Since the pandemic, technology has become more deeply integrated into our daily lives than ever before. In this era of Industrial Revolution 4.0, other technologies ensure reliability.

2.1.5 Usage Intention

There are under industry revolution 4.0 era, go digital is the main trend of all industry. In epidemic period, go digital is the only way to save businesses, especially the catering retail industry during the economic downturn. (Wong and Cheung and Chen ,2020, Budnitz and Tranos,2022) Digitalization is a tool for industry innovation.

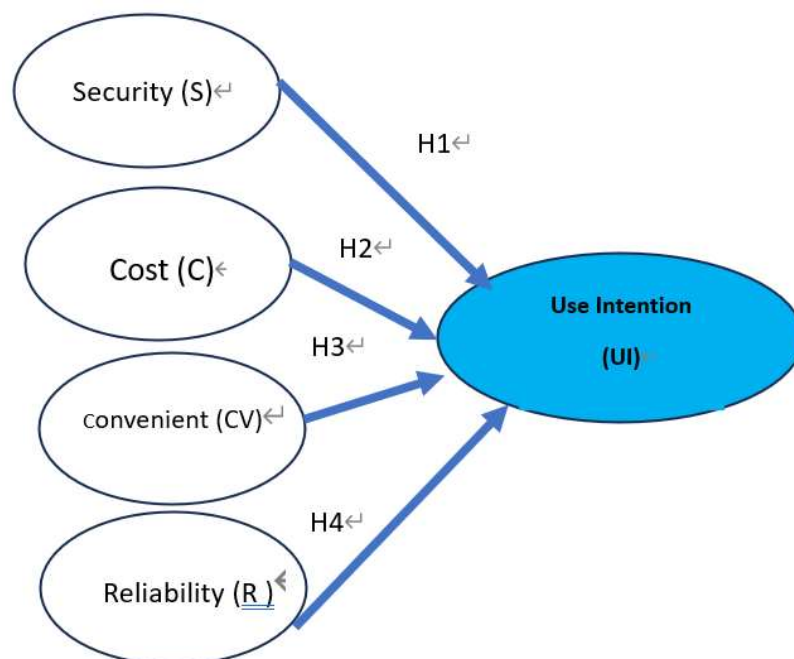
In order to better serve the residents, different PM continue to use SBT. The epidemic seems to be affecting the real estate industry. With the sudden and widespread emergence of working from home and the use of online applications, the industry itself required radical changes. (The Hong Kong Institute of Housing, 2023c) The concept of Prop Technology requires high-quality services in terms of value-added services. (Lee, 2024)

Thus, the widely spread of PropTech still have a long way to go. For the factors mentioned, security concerns, cost issue, convenience and reliability are essential factors toward usage intention.

2.2 Formulation of Research Framework and Hypothesis

Willis (2023) stated that research questions generate hypotheses to determine appropriate investigations or interventions to answer the questions. The study analyzed the factors that influence residents' willingness to use SBT and the correlation between variables such as safety, cost, convenience, and reliability. The purpose of this study is to test hypotheses regarding these characteristics and their impact on usage intentions. This study helps improve strategies to promote and disseminate the use of SBT. Improving the satisfactions of customers and the image to target the goal in increase the brand image.

Figure 2.2 Research framework



Research hypotheses.

H1: A positive relationship exists between security and use intention for SBT in buildings.

H2: A positive relationship exists between Cost and use intention for SBT in buildings.

H3: A positive relationship exists between convenience and use intention for SBT in buildings.

H4: A positive relationship exists between reliability and use intention for SBT in buildings.

Chapter 3 Research Methodology

Using methodical and systemic way to addressing the issues is the function of research. It consists of formulate the hypothesis, data gathering process and draw conclusions from the analyzed information. Kothari (2004) mentioned the conclusions and the solutions can be used for issues and the theoretical ideas. According to research onion of Saunders et al, (2023), this research is using Positivism comes up with research questions and hypothesis in philosophy.

3.1 Research method ↵

Quantitative and qualitative are commonly used in academic research. Walsh et al (2015) stated it collect quantitative (numbers) data to identify hypotheses to be tested in subsequent rounds of data collection and idea analysis to test the theory. (Bryman and Bell, 2015, Collis and Hussey, 2013)

Silverman (2016) stated qualitative research (opinions and experiences) involves setting up hypothesis based on theoretical themes and using final survey data to analyze and prove hypothesis claims. Castelan (2010) stated that it involves collecting data through interviews, observations, and written documents. Researchers analyze data for specific themes and patterns to write stories and explanations. Wolstenholme (1999) cited qualitative research allows for in-depth exploration of ideas and experiences. This study used a survey strategy in collected standardized data from multiple respondents for easily comparison. (Saunders et al., 2019) This kind of research commonly used open-ended question, observations in open-end words descriptive to explore the concept and theories in the literature reviews. (Raimo, 2019) The planned questions can be asked as how to count or measures, find out the meaning, or how to describe by throw out of an idea and prove later into a question which involving the discovery of a specific phenomenon. It allows for a level of detail to be developed through intense involvement in authentic experiences and focuses on examining social phenomena from the perspective of the participants.

To develop research strategies in different research designs, use qualitative research methods that provide both in-depth and partial understanding of the topic (William, 2007).

This study will adopt a quantitative approach. It allows analysis and prediction using statistical analysis. It is a deductive method in which data are collected and analyzed to test a theory. For example, researchers analyze quantitative data to determine hypotheses to be tested in subsequent rounds of data collection and analysis. (Saunders et al., 2019, Walsh et al., 2015)

It is good at testing results and proving theories, and theoretical analysis is more direct and avoids subjectivity. Nevertheless, it may lead researchers to overlook broader themes and their interrelationships. Focusing solely on numbers can lead to missing the bigger picture. Research may be misleading due to the researcher's opinions and biases. The difficulty in establishing a research model depends on the setting of hypotheses in collecting data. T Errors may occur during setup. (DEVAULT, 2020)

Primary data defined as the first-hand data derived from the survey about the variables. The survey will assist the researchers to collect the relative information after the specially designed questions to ensures the relevant are framed. (Babin and Zikmund, 2016) Face-to-face interview are also the quantify data closed.

Secondary data are the information from third party that is second-hand sources. Information from other scholars in literature reviews used in chapter 2. This can also define as the sources are published to the public. The information released from government, and other market research. Online sources like academic journals, news articles, market research and reports can be the collection of secondary data.

Table 3.1 Characteristics of Quantitative and Qualitative Research Methodology

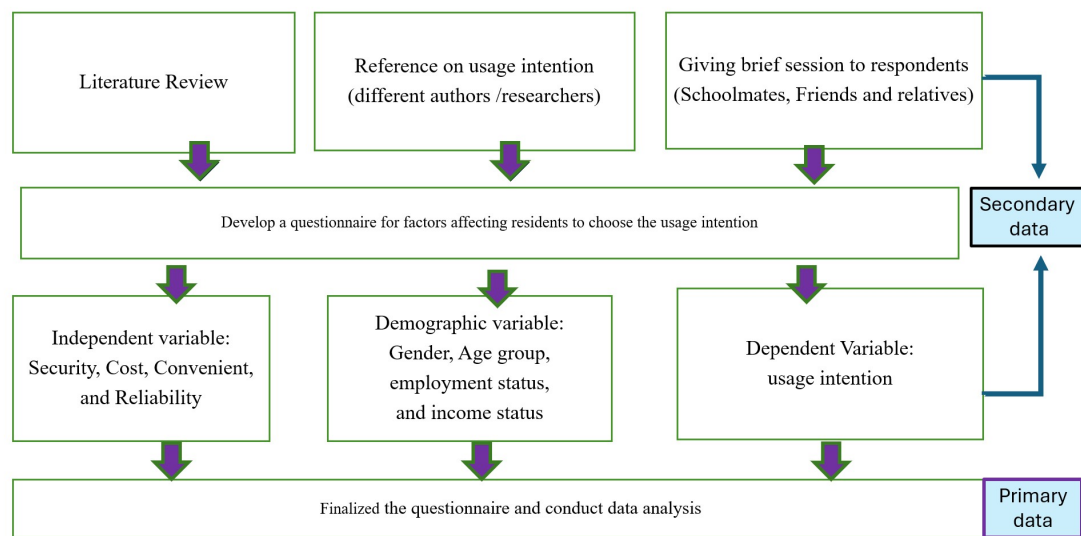
Items	Quantitative Research Methodology	Qualitative Research Methodology
Philosophical Assumptions	A researcher remains a distant and independent of being researched, not value-laden kept out	Multiple & subjective reality where the researcher interacts with that being researched, value-laden inseparable
Approach to the development	Experimental, single subject and descriptive, comparative, correlational and in cause- and -effect factor by setting hypothesis. Deduction Approach is to begin with a theory to test	Phenomenology, case study, cultural studies Induction Approach- generating theories from research with various aspects or categories.
Purpose/Goal of Research	Generalizability, explanation, prediction	Understanding, to have new insight and to interpret new interpretation
Questions or Hypothesis	The hypothesis is informed and set form theories to ask by set questions	Questions is evolving in open ended to flow by theme which in general and flexible
Targeted population	Randomly selected sample, proportionally representative of the population	Selected numbers of non-representative cases
Data collection	Questionnaires, surveys, and tests in the form of numbers and statistics with largely closed-ended questions with optional response. It can be objectively measure.	Written documents from fieldwork, interviews, pictures, observations in open-ended questions without optional response. It is subjectively measure.
Data Analysis	Descriptive and inferential numeric data use statistical analysis	In forms of test data, description and analysis, pictures, information tables which needs to code into themes, patterns to theory

Source: Bryman, 1998

3.2 Research framework

Figure 3.2 shows the research structure in considering factors such as security, cost, convenience, reliability and the usage intention. These findings provide valuable understanding for businesses to investigate the improvement and increase the intention to use SBT.

Figure 3.2 Research framework affecting the use intention of SBT



Source: Constructed by the Author

3.3 Research hypotheses

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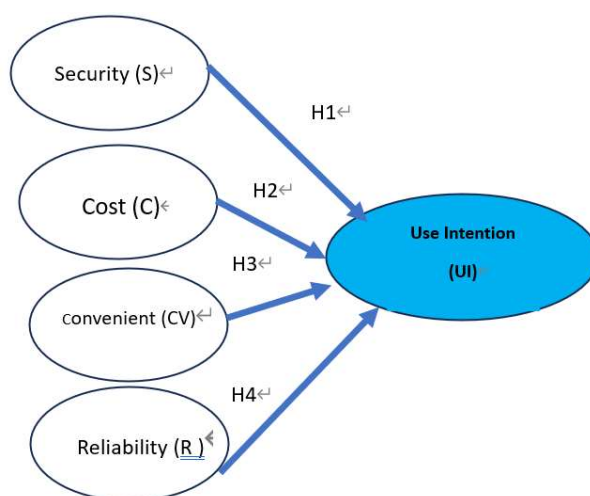
H1: A positive relationship exists between security and use intention for SBT in buildings

H2: A positive relationship exists between Cost and use intention for SBT in buildings.

H3: A positive relationship exists between convenience and use intention for SBT in buildings

H4: A positive relationship exists between reliability and use intention for SBT in buildings

Figure 3.3 Research Hypothesis



Source: Constructed by the Author

3.4 Research Design

This study will use a mixed methods approach of quantitative research. Quantitative methods allow the use of statistical analysis for analysis and prediction. (Creswell et al., 2003)

3.4.1 Coding of Variables

Each variable is coded and grouped by nature. (University of Southern California, 2024)

Table 3.4a Coding of Variables

Nature of Variables	Independent Variables (IV)	Dependent Variables (DV)
1	S- Security	UI-Use Intention
2	C -Cost	
3	CV - Convenient	
4	R - Reliability	

Source: Constructed by the Author

Table 3.4b Coding of 5 variables and source of questionnaires

Variable	Nature	Operationalization	Source
S	IV	Q1-5	Grunewald, and Pyle and Weir (2019) , Li (2023) , he Hong Kong Institute of Housing (2023a) Crown (2021) ,ProptechHK (2023), Daniel and M. and Fadi (2018), illis (2023) Omolara et al (2022), BM (n.d), 港經濟日報 HKET (2016), Schuster and Habibipour (2022) Office of the Privacy Commissioner for Personal Data (n.d) Office of the Privacy Commissioner for Personal Data (2019), Caso et al. (2023), HSBC HK (n.d.) Cichy and Salge and Kohli (2021), Surya (2019), Koohang et al. (2022) , Pal et al. (2021) Schomakers et al. (2022), Xu and Wang (2022)
C	IV	Q6-10	The Hong Kong Institute of Housing (2023a), The Standard (2022), McKinsey & Company (2020) , Hall (2022), ProptechHK (2023) Valle (2023), Hong Kong Institute of Housing (2023b), KPMG (2020), HKT (n.d.) Groote and Volt and Bean (n.d.), Babar et al (2021), McKinsey & Company (2020) Amin et al (2017), Salerno et al. (2021), Atha et al.(2020), 香港經濟日報 HKET (2016) Lee et al. (2024), Vocational Training Council (2023)

Source: Constructed by the Author

CV	IV	Q11-14	The Hong Kong Institute of Housing (2023c), Nyberg, and Shaw and Zhu (2021) Mekky (2022), Scheinfeld et al. (2022), Mastercard Economics Institute (2023) Chang and Nam (2021), Kemp (2024), Varshini et al (2021) Capris et al (2022), Shuhaiber and Alkarbi and Almansoori (2023) Huber et al (2019), Johnson Controls (n.d.), Luo et al (2023)
R	IV	Q15-18	The Hong Kong Institute of Housing (2023a), Moore, et al (2020) , Kharchenko, et al, (2016) 香港經濟日報 HKET (2016), HKTDC (2021), SHKP (n.d.)
UI	V	Q19-22	Lee (2024), Wong and Cheung and Chen (2020) Budnitz and Tranos (2022), The Hong Kong Institute of Housing (2023c)

Source: Constructed by the Author

3.4.2 Questionnaire design

A 7-point Likert scale was used for precise responses in detailed questionnaire to understand residents' preferences and intentions for using SBT by a well-crafted statement. (Joshi et al., 2015, Longe, 2019).

The survey with 26 questions in the 7-point scale and in a closed-end questions can be used. Being clearer, a consistent format responses answers are given at seven-point scale (1=strongly disagree, 2=disagree, 3=disagree, 4=neutral, 5=slightly agree, 6=agree, 7=Strongly agree). The scale was given to the respondents on Usage intentions of SBT in residential buildings. The Primary data collection through the questionnaire set in 26 questions with 2 parts, the first part is the questions about the level of intentions to use based on the mentioned variables while part 2 will be the personal information of the respondents about gender, age, income, and education level. The questions are set based on the variables as security, costs, convenience, and reliability. The kind of consequents are set to reduce the bias and the mind to refuse to answer the survey. Besides, the questions are set under 30 questions and can be answer within 5 minutes to avoid the duplicate and fatigue of the respondents in answer the survey. Google form is most effective method to collect the surveys online through the snowball method between friends, relatives. Bias could be emitted from anonymous responds.

3.4.3 Target population

The research is to find out any possibilities in residents' buildings where managed by the property management companies over Hong Kong citizens. All genders who up to 16 years old regardless employment and income levels. It is gathered from 6,666,300 aged 16 or above regardless the employment status and monthly income. The survey will be via Google form. (Census and Department of Statistics, 2023) The population is based on the number of residents lived in the buildings blocks and to find out the Usage intention of the SBT. Non-purpose data collection for the markets will being asked.

3.4.4 Sample method

Snowball sampling (called Random sampling) and non-random sampling is commonly used. Kelley et al. (2003) pointed out that random sampling is often used in quantitative research as the population are equal probability in selection. This is to reduce prejudice. Random sampling requires significant effort and resources in detailed planning and verification to ensure complete unpredictability. Depending on the limitations, researchers may choose convenience sampling as non-random sampling which requires less time and resources to collect information. Online survey will be used in this study through social networks to eliminate prejudice of SBT over the residents in Hong Kong.

3.4.5 Sample size

Morse (2000) pointed out the calculating equation to have the number of samples. The equation is to ensure that the sample size is suitable for the conducted research.

$$\text{Equation of Sample Size} = \frac{(Z\text{-score})^2 - \text{StdDev} * (1 - \text{StdDev})}{(\text{margin of error})^2}$$

This sample survey uses the total population of Hong Kong as a sample. A total of 200 questionnaires were distributed and 156 questionnaires were returned. All online surveys are targeted at all age groups between 16 and 80 years old, regardless of gender, income and education level of residents. The important of the data is the age of the respondents aged 16, the population is derived from the Census and Statistics Department in Hong Kong, around 6.6 million of individuals. The number of the results stand at 8% of the margin of error (Patil, 2015) The sampling method is purposive sampling, and the results of this survey can dictate individual and organizational decision-making. (Lakens, 2022).

3.5 Data Analysis Procedures

Study began with a quantitative analysis of all received data through the survey. Statistical Suite for the Social Sciences (SPSS) will be conducted as analyzes by inferential and descriptive statistics which is a well-respected statistical program. The functions in SPSS include reliability testing, especially Cronbach's Alpha, and regression analysis, including simple regression and multiple regression will be used in this study. (Barbera et al, 2020, Pallant, 2016)

Use SPSS to analyze the collected data to check factors in security, cost, convenience, and reliability whether affect usage intention. Linear regression measures the relationship between variables to improve current strategies and customer satisfaction. (Saleh and Sardar, 2021) Security, costs, convenience, and reliability will be checked in the influence on the usage intention which could be positive or negative. The hypothesis will be proved in the study.

To measure the relationship between two types of variables and the degree of their relationship in between, multiple linear regression can be used, which can be positive or negative. (Tranmer and Elliot, 2008) The analyse data and make for predictions. As there are four independent variables and one dependent variables in this study, it is necessary to evaluate four hypotheses to determine the positive effect between the two variables.

Descriptive data will be generally present in the first part of Chapter 4 to give an idea of the respondents. And it will come to have the frequency, mean standard deviation and other related functions will be expressed.

Using of Cronbach's Alpha to check the reliability of the collected data. (Frost, n.d.) This is the method to check the validity and the level of trust of the collected data. Killic (2016) stated higher index means a higher consistency that is trustable which is to ensure the structure are under integrity and accuracy. More meaningful insights will be derived from the data after the test conducted as analysts feel confident about the accuracy and validity of the results.

According to Tavakol and Dennick (2011), the index at 0.7 or greater will be considered acceptable and appropriate. In the SPSS process, there are totally 5 variables exhibits on the survey shown the value surpasses 0.7 in the Cronbach's Alpha and indicated that the survey was carefully designed in the questions to make sure the reliability and appropriate for the intended purpose.

3.6 Ethical considerations

Ethical considerations are important to any of the study which needed to pay careful attention. It is to ensure safe without unnecessary stress to the participants for the study. (Hasan et al, 2021) Participants in this study obtained informed consent prior to participation and were informed of their right to withdraw at any time. The data are collected by the anonymous respondents which the researcher does not know as it is conducted without a named. And the collected data is finished through the human connections which is sincerely and ethically answered by the respondents themselves. Information will be treated as anonymous to ensure the confidential such as their name or email address. The data is stored securely by the researcher and will be destroyed after six months. Google form is used in the study and is open to communicate with any questions about the ethical conducts to the online survey.

3.7 Pre-test

Questionnaire pre-testing is crucial to determine the validity and reliability of the questionnaire. Silk and Urban (1978) mentioned that it is a tool to prevent the failure in the result and is to provide an opportunity to spots the areas to improve in terms of easier understanding. Adjustments and corrections should be carried out to ensure participants understand and can conduct freely and honestly. Pilot testing can verify on the reliability and accuracy of the survey, then the final questionnaire is distributed to participants. That can be able to have accurate and dependable answers comfortably and truthfully.

Thus, it is necessary to carry out a pre-test. The questions are set based on the journal's supporting references. A more detailed and reliable questionnaire will make a more reliable contribution to the research and ensure the accuracy and reliability of the questionnaire. Pilot test had been done by a group of colleges before distributing to the

participants. Briefing sessions are given to the respondents before the pre-test for explaining the intention of the questionnaire is used only for the academic purpose while the analyzed result will be shared with HHH for the better of the strategies. There are totaling 40 results returned from the respondents which more than 10 % of the total sampling size of 385.

3.8 Research Flow and Schedule

A sound structured schedule is important in the process of conducting research. It is important for the researcher to keep track on the process. ↵

↵

During the research period from November to April, the research will be guided by the mentor in the use of literature, research methods and established goals. The setting of the research topic is carried out in November after approved by the mentor. After the topic was confirmed, the literature review used in this study should be found to ensure the solid foundations of the research. Objectives and specific goals should be set concise and clearly outlining the questions and methodology used in the study. ↵

↵

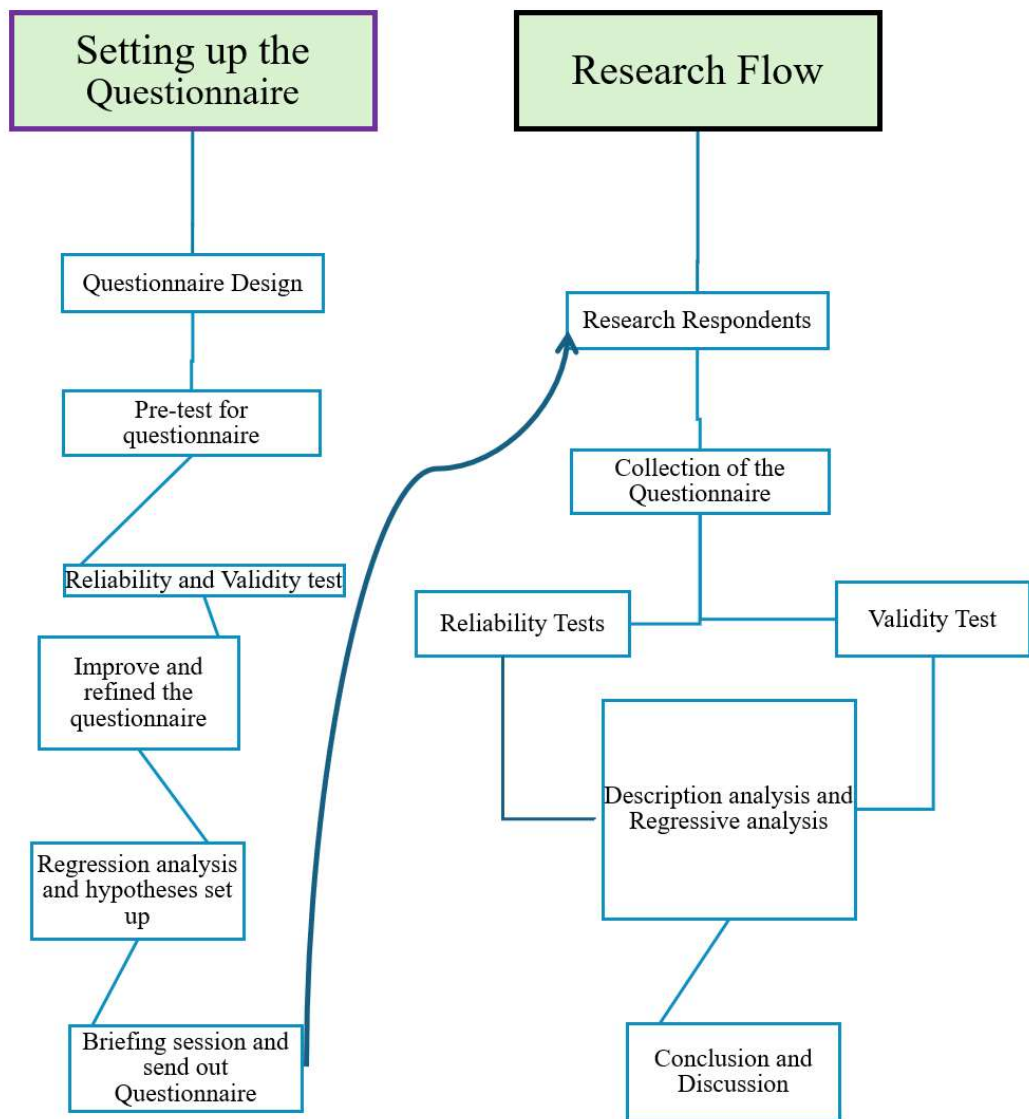
It takes times to review the literature to assure the concepts of the topic chose and to re-confirm the ideas of the researcher. After the review of the literature, questionnaire should be formed, and pre-test should be carried out to ensure the validity of the questionnaire. Pre-testing will be taking place in the late December and the survey will be conducted in January with Chapter 3. The result will be discussed in Chapter 4 by using statistical tools SPSS in February. Finally, conclusion and suggestions are made for HHH in Chapter 5 and 6 in March and April. Advice from mentor needs to be take place within the process and adjustments made after feedback. Any necessary revisions should be made before the final submission of the dissertation. ↵

Figure 3.8a Gantt Chart⁴⁷

Gantt Chart of the Study							
Project Tracker	Q4 2023			Q1 2024			Q2 2024
	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Considerng thr topics of the research	Stage 1						
Decide the supervisor of the Dissertation	Stage 1						
Gather the relevant informtion from the Journals and making reference	Stage 1						
Drafting chapter one -introdcuton	Stage 1						
Drafting chapter Two- Literature Review	Stage 1						
Start to design the questionnaire	Stage 1						
Check with the reliability of the pre-tested questionnaire			Stage 2				
Distributing the questionnaire to public			Stage 2				
Drafting Chapter three- Research Methodology			Stage 2	Stage 3			
Gather data and input the data for analysis in SPSS.				Stage 3			
Drafting Chapter Four					Stage 4		
Drafting Chapter Five						Stage 4	
Submit to Supervisor for comments	Thought the period						
Havings advices from supervisors							Stage 5
Final Submission the Dissertation							

Source: Constructed by the Author

Figure 3.8b Research workflow



Source: Constructed by the Author

Chapter 4 Analysis and Results Discussion

In this section, the data will be conducted in analyzing from the returned survey. The data collected is extensive in the picture for the overview of the responses, their expectations of the factors, the gender, age group, employment status, and monthly income. The records will show the overall observation of their concerning on the usage intention of the SBT. The below part, there will be a comprehensive data of the respondents. The analyzed results will come after. Charts and tables will be used to have clear and accurate pictures to have the ideas.

4.1 Response Rate Analysis

No invalid online data was found in the survey during the data input process, and all required fields were answered without any omissions as the online form was set to require answers to ensure high data quality. A total of 156 people living in Hong Kong participated in the survey and completed the questionnaire online.

Couper (2000) noted that online surveys can be very challenging in determining accurate response rates on the extra effort required to check who clicked on the survey hyperlink and answered the questions. Nevertheless, it is important to note that 156 respondents received, which meet the recommended sample size range outlined in Chapter 3. That is in satisfactory level in the response rate and quality of data collected.

It must be taken into account that the reason for 156 people were willing and able to answer, return and understand the inquiries that provided had nothing to do with their age. Porter and Whitcomb (2005) mentioned that it is important to acknowledge the possibility of dropout from online surveys. This requires careful selection of the appropriate website and inclusion of the message or data stolen before transmitting the survey hyperlink.

4.2 Descriptive Statistics

This part given the overview on demographic information of all respondents, from the profiles and the characteristics of their preferences in the intention to use SBT. Carefully analyzed will be carried out in demographic data in conjunction with survey response patterns.

4.2.1 Statistic Description on Gender of Respondents

Table 4.2a Statistic Description on Gender of Respondents

Q23. Gender					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	86	55.1	55.1	55.1
	Male	70	44.9	44.9	100.0
	Total	156	100.0	100.0	

According to Table 4.2a, total of 156 results returned in the survey in which female in 86 shared 55.1% and male in 70 shared 44.9% of the total respondents. It shows that the respondent of female is larger than male which matches the current population in Hong Kong. (Census and Department of Statistics, 2023)

4.2.2 Statistic Description on Age group of Respondents

Table 4.2b Statistic Description on Age group of Respondents

Q24. Age					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-29	25	16.0	16.0	16.0
	30-49	83	53.2	53.2	69.2
	50-59	21	13.5	13.5	82.7
	60-69	21	13.5	13.5	96.2
	16- 17	5	3.2	3.2	99.4
	Aged 70 or above	1	.6	.6	100.0
	Total	156	100.0	100.0	

It is divided into 6 groups among the respondents from the group of 16 to 17 to the group aged 70 or above. In table 4.2b, there are shown as the distribution of the population of Hong Kong. The majority is the age at 30 to 49 in 83 shared 53.2% of the total respondents. Aged 18 to 29 came the second in 25 in 16%. Aged 50 to 59 and 60 to 69 shared 13.5 among the result. Aged 16 to 17 will be the second smaller group in 5 responses in 3.2% while the smaller group in aged 70 or above only have 1 result. The results stated the current situations of Hong Kong.

4.2.3 Statistic Description of the Employment Status of respondents

Table 4.2c Statistic Description of the Employment Status of respondents

Q25. Employment status					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Employed	125	80.1	80.1	80.1
	Housewife	7	4.5	4.5	84.6
	Retired	11	7.1	7.1	91.7
	Student	9	5.8	5.8	97.4
	Unemployed	4	2.6	2.6	100.0
	Total	156	100.0	100.0	

Among the 156 respondents, there are 125 responses are the working force in the Hong Kong. And it is interesting in the result as the non- working force are 31 in housewife, retired, student and unemployed. it shows retired persons also shared 7.1% and students shared 5.8%. The rest categories in housewife and unemployed were severely underrepresented, with only 7 respondents are housewife (4.5%) and 4 respondents unemployed (3.6%) in table 4.2c.

4.2.4 Statistic Description of the Monthly Household Income of respondents

Table 4.2d Statistic Description of the Monthly Household Income of respondents

Q26. Monthly income					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<\$10,000	28	17.9	17.9	17.9
	>=\$50,000	22	14.1	14.1	32.1
	\$10,000-\$19,999	46	29.5	29.5	61.5
	\$20,000-\$29,999	35	22.4	22.4	84.0
	\$30,000-\$39,999	19	12.2	12.2	96.2
	\$40,000-\$49,999	6	3.8	3.8	100.0
	Total	156	100.0	100.0	

From table 4.2d, the respondents divided into 6 groups in monthly income. The groups ranked from less than \$10,000 to the highest in more than \$50,000. The group of \$10,000 to \$19,999 are the largest group among the respondents at 29.5%. The group

of \$20,000 to \$29,999 shared 22.4% comes to second large group. The lowest group is the one in \$40000 to 49999 at 3.8%. Interestingly, the lowest and the highest monthly income group are 17.9% in the group less than \$10,000 and 14.1 in the group of more than \$50,000. In Hong Kong, most of the population earning around 10000 to 19999 which explained the results.

4.3 Inferential Statistics

Data analysis proves is crucial to obtain the results. It involved several steps in examine classify, tabulate, or regroup proof to match the initial existence of the study. (Yin, 1989). Krueger and Casey (2000) believed that to re-examine the original intention of the research from beginning of the analysis is crucial to state a clear understanding of the purpose of the research to the success in come across with the challenging to implement. That is very beneficial for effectively managing the data. Rabiee (2004) explained that the approach enables the reader to understand complex information, eliminate irrelevant data, and safely navigate complex information paths. This part will analysis data collected in the variables in security, cost, convenience, reliability, and Usage intention. The analysis will include and explain reliability testing, correlation analysis, and regression analysis.

4.3.1 Reliability and Validity Measurement

Multiple items in a question set are more likely to achieve credible reliability. Studies that elicit meaningful decisions through single question sets may be unreliable (Gliem and Gliem, 2003). Thus, his study set four to five different multi-item set questions in each domain, which can ensure the accuracy and significance of the results. The use of reliable and valid measures is critical to obtaining valid findings. Using a multiple item set of questions could use to examine the results to be accurate.

A Likert Scale method used to for each variable to ensure consistency among multiple questions. Cronbach's Alpha coefficient is one of measurement to test the reliable of the questions. According to Tavakol and Dennick, (2011), when the coefficient falls between from 0.7 to 0.95 means an acceptable alpha level.

V1: Security

Table 4.3(a): Reliability Statistics of Variable-Security

Reliability Statistics	
Cronbach's Alpha	N of Items
.846	5

In 4.3a, a total of 5 items for set to check the respondents' opinions on security. In the test of Cronbach's Alpha, the value is 0.846 and greater than 0.7. It is indicated the greater level of consistency and reliability in this variable.

Table 4.3 (b): Item-Total Statistics of Variable-security

	Item-Total Statistics			
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q1. S- I agree that safety is the most important reason that I choose to use smart building technology.	18.68	24.090	.597	.831
Q2. S- I agree that Smart Building Technology can security for the property.	19.06	23.506	.706	.801
Q3. S- As <u>human kind</u> may affected by emotions to make wrong decisions, so technology will better in safeguard my building.	19.17	24.424	.644	.818
Q4. S- I agreed that the Smart building technology can protect personal info and history.	19.89	22.472	.663	.814
Q5. S- I agree that smart building technology can protect the building well and better than human.	19.38	24.804	.676	.811

In 4.3a, the Cronbach's Alpha value is 0.846 are defined as acceptable which means the scale is solid and trustworthy in the internal consistent. The correlation between the five items is expected to remain stable. These findings suggest that the scale is a valid and consistent measure of the construct being assessed.

V2: Cost

Table 4.3(c): Reliability Statistics of Variable cost

Reliability Statistics	
Cronbach's Alpha	N of Items
.853	5

In 4.3 c, this variable set-in questions of 5 items asking the opinions of cost. The value of Cronbach's Alpha laid on 0.853 showed the consistency level and reliability is high. This finding revealed this set of items is reliable and provides a reliable to measure the opinions on costs.

Table 4.3d Item-Total Statistics of Variable cost

Item-Total Statistics				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q6- C I agree smart building technology will reduce cost because of the preventive alerts and to takes any measures to rectify the defects before the huge costs in replacement work.	21.35	19.456	.650	.828
Q7. C I believe smart building technology will solve the shortage of headcounts.	21.31	17.520	.691	.817
Q8. C I believe the use of Smart Building Technology will result in slow down the trend of increasing in management fee on long run.	21.85	17.520	.664	.825

Q9. C I believe the use of Smart Building Technology will decrease the cost spend on routine and repetitive work. Management can have time in analyze to the high-level decisions.	21.29	18.364	.710	.812
Q10. C I believe the value of property will raise if use Smart Building Technology.	21.49	18.832	.626	.833

The aboved table showed the item-total statistics and the value of Cronbach's Alpha is 0.853. It is stable in all items in the correlations which is larger than 0.4. This shows the robust and reliable in the internal consistency.

V3: Convenience

Table 4.3e Reliability Statistics of Variable Convenience

Reliability Statistics	
Cronbach's Alpha	N of Items
.788	4

AS compared to the other variables, it is a bit lower as 0.788 while greater than 0.7. Value 0.7 in Cronbach's Alpha will counted as acceptable. It means that the 4 items in this variable in convenience still confidence in the level of consistency and reliable to the opinions.

Table 4.3 (f): Item-Total Statistics of Variable convenience ↵

↵	Item-Total Statistics↵			
	Scale Mean if Item Deleted↵	Scale Variance if Item Deleted↵	Corrected Item- Total Correlation↵	Cronbach's Alpha if Item Deleted↵
Q11. CV↵ I believe the use of Smart Building Technology will smooth the flow of current operations of buildings.↵	16.57↵	10.079↵	.636↵	.720↵
Q12. CV↵ The interfaces of the system of Smart Building Technology will affect my intentions to use.↵	16.56↵	10.738↵	.406↵	.831↵
Q13. CV ↵ User friendly is the key for me to use Smart Building Technology. I agree that Smart Building Technology will easy my life as it assist me to save time to collect in the information and assist me to make quicker decisions.↵	16.39↵	9.762↵	.674↵	.701↵
Q14. CV↵ Apply smart building technology to provide my visitors with an easier and smoother visitor registration process to entering the building. This helps me and makes me proud.↵	16.61↵	8.162↵	.709↵	.673↵

The statistics in Table 4.3 f presented the detailed statistics of the value for Cronbach's Alpha rated in 0.788 in acceptable level. The consistency and reliability level are deemed high, and it also provides a reliable measure in the variable of convenience.

V4: Reliability

Table 4.3 (g): Reliability Statistics of Variable Reliability

Reliability Statistics	
Cronbach's Alpha	N of Items
.826	4

In 4.3 g, the 4 items are collected in the response of the reliability. Among the other variables, this only have 4 items in the variable, and it is 0.826 in the Cronbach's Alpha value. This gives a proof in the dependability and consistency level is high in this item.

Table 4.3. (h): Item-Total Statistics of Variable reliability

Item-Total Statistics				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q15. R I believe in the reliability of the use of smart building technology in property in all levels.	16.53	9.941	.648	.782
Q16. R I trust results made from the smart building technology.	16.47	9.322	.708	.753
Q17. R I agreed smart building technology can do repetitive and tedious tasks and perform better than humans.	16.04	9.101	.683	.765
Q18. R I can trust the smart building technology to do the dangerous works and reduce the risk of any accidents.	16.05	10.294	.567	.817

As shown in Table 4.3(h), Cronbach's Alpha value is 0.826, which is considered satisfactory. This value indicates of the scale is solid and reliable in the internal consistency. Correlations over the four items were found to be acceptable. It is observed that the scale is an appropriate and consistent in measurement for assessing.

V5: Usage intention

Table 4.3 (i): Reliability Statistics of Variable usage Intention

Reliability Statistics	
Cronbach's Alpha	N of Items
.719	4

In the Cronbach's Alpha value, over 0.7 to 0.9 will be treated as satisfactory. And this part shows 0.719 means it is still acceptable. This part consists of 4 items to inquiring the feedback of the Usage intention. It shows the dependency and the consistency of the sets of items are acceptable.

Table4.3 (j): Item-Total Statistics of Variable Usage intention

Item-Total Statistics				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q19. UI Security concerns will affect my intentions to use smart building technology.	16.10	10.694	.431	.709
Q20. UI Cost is the most issue affecting of the willingness of the use of smart building technology.	15.99	10.845	.586	.614
Q21. UI User friendly is the reason for me to use Smart building technology.	15.90	11.318	.475	.675
Q22. UI I think smart building technology is a trustworthy technology.	16.53	10.534	.552	.629

The part shows the designated four items are set to collect the feedback of the use intention. The 0.719 of Cronbach's Alpha value is still acceptable and the dependability and consistency for this still trustable. Even there are only 0.431 and 0.475 in the correlation consistency, however, the scale of the variable of reliable measurements is well constructed.

4.3.2 Correlation Analysis

To better in measure the strength of the association between two variables, correlation is a valuable statistical tool. This allows the analysis results of the relationships among the variables, positively or negatively correlated or uncorrelated. Whenever one variable affects another variable in any changes, that can be conclude in related relationship. (Obilor and Amadi, 2018). In correlation analysis. The indication of coefficient is strength if fall in 1 and -1, (Zou and Tuncali and Silverman, 2003). The results of this study show relevant results as discussed below. The results of this study show relevant results as discussed below.

Table 4.3 k) Correlations on Security, Cost, convenience, reliability, and Usage intention.

		Correlations				
		Average of Security	Average of Cost	Average of Convenient	Average of Reliability	Average of Usage Intention
Average of Security	Pearson Correlation	1	.646**	.559**	.579**	.695**
	Sig. (2-tailed)		<.001	<.001	<.001	<.001
	N	156	156	156	156	156
Average of Cost	Pearson Correlation	.646**	1	.648**	.751**	.578**
	Sig. (2-tailed)	<.001		<.001	<.001	<.001
	N	156	156	156	156	156
Average of Convenient	Pearson Correlation	.559**	.648**	1	.708**	.602**
	Sig. (2-tailed)	<.001	<.001		<.001	<.001
	N	156	156	156	156	156
Average of Reliability	Pearson Correlation	.579**	.751**	.708**	1	.604**
	Sig. (2-tailed)	<.001	<.001	<.001		<.001
	N	156	156	156	156	156
Average of Usage intention	Pearson Correlation	.695**	.578**	.602**	.604**	1
	Sig. (2-tailed)	<.001	<.001	<.001	<.001	
	N	156	156	156	156	156

** . Correlation is significant at the 0.01 level (2-tailed)

Pearson Correlation coefficients is a liner correlation among two sets of data in the ratio of the covariance of the variables and the standard deviations. (Schober and Boe and Schwarte, 2018) The significance value, also called the p-value is an important statistical analysis indicator. The value in 0.01, equals to 0.99% in confidential level. If the p-value is less than 0.05 and falls between negatively and positively 0.05 is acceptable level. The indication of the correlation between the variables are statistically significant. It is considered acceptable in P-value. A significance values help to make sure that observed results are not likely from the result of chance.

In Table 4.3(k), the correlation coefficient between security and intention to use is 0.695 ($r=0.695$, $p<0.001$), showing a strong positive correlation in between. This concept is also similar to the case between cost and intention to use SBT, which is 0.578 ($r=0.578$, $p<0.001$). It also shows a positive correlation. Meanwhile, the coefficient between Convenience and usage intention is 0.602 ($r=0.602$, $p<0.001$), and the coefficient between reliability and usage intention is 0.604 ($r=0.604$, $p<0.001$), both are shown the existence of positive relationship. Their relationship is strong and positive correlated among the variables and Usage intention.

Figure 4.3l Average of security to Usage intention

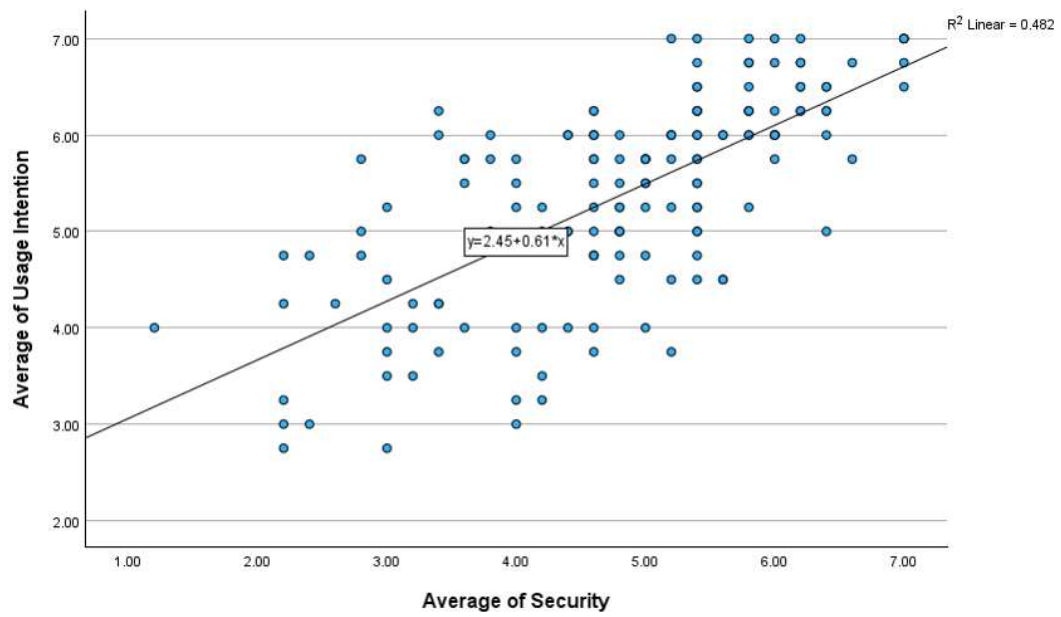


Figure 4.3m Average of cost to Usage intention

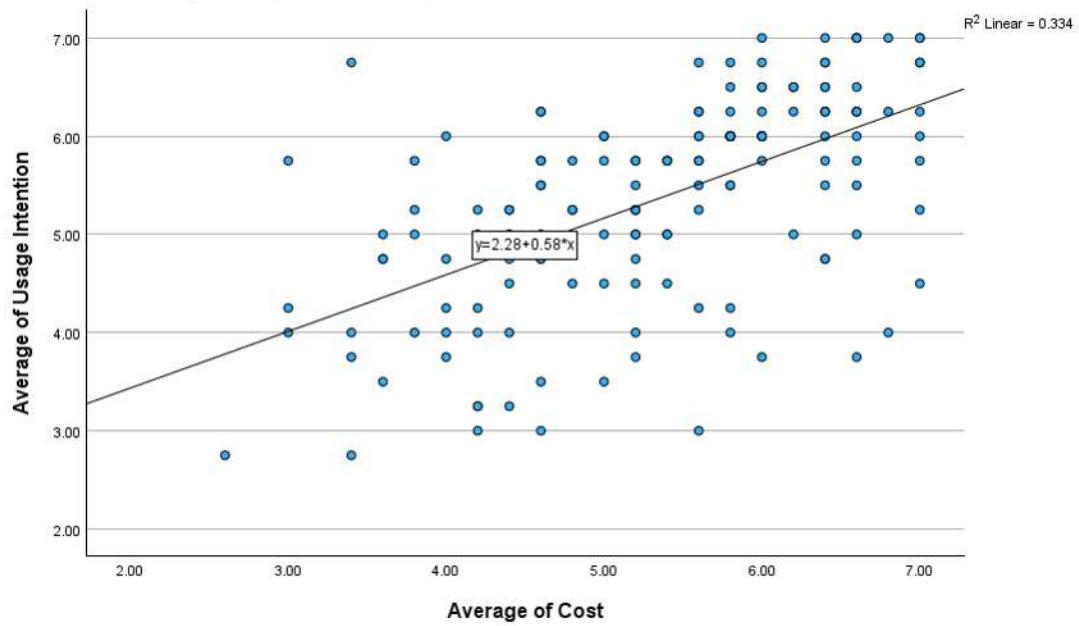


Figure 4.3n Average of convenience to Usage intention

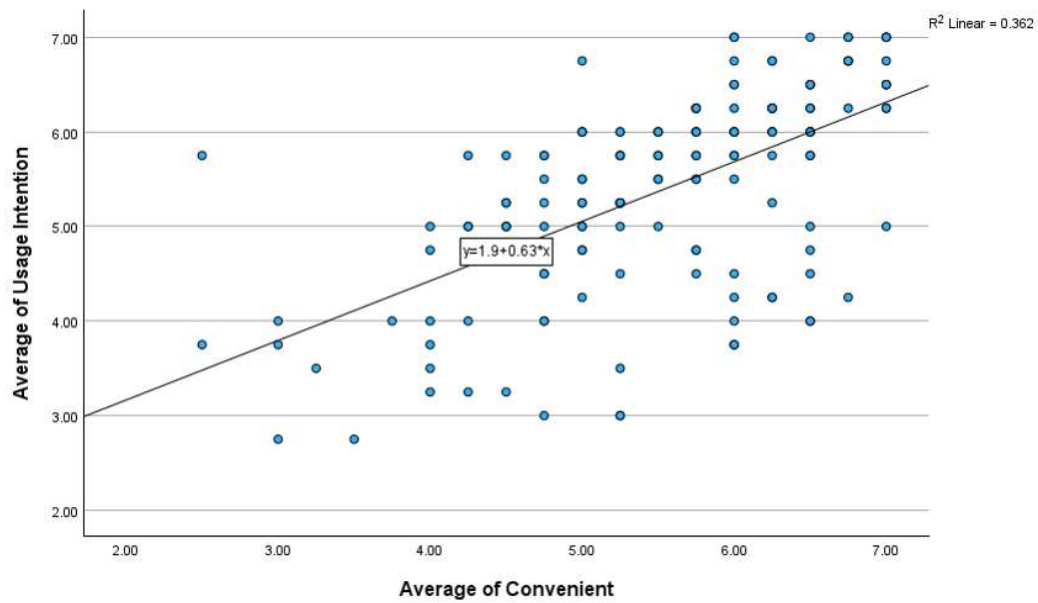
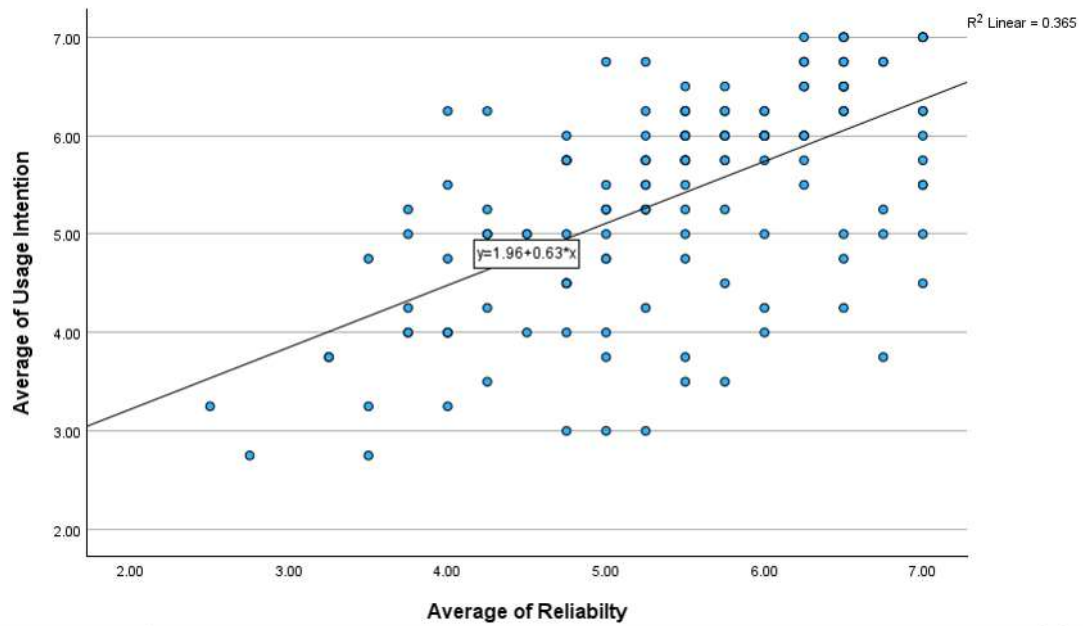


Figure 4.3o Average of Reliability to Usage intention



4.3.3 Regression Analysis

According to Sweet and Grace (1999), regression analysis is an initial statistical tool used to determine whether one variable can be used to predict another variable. This method uses linear regression to detect a straight-line relationship between predictor and response variables. This study presents a single result from a regression analysis.

Table 4.3p Regression Model Summary on Security, costs, convenience, Reliability and Usage Intention

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.751 ^a	.564	.552	.70242

a. Predictors: (Constant), Average of Reliability, Average of Security, Average of Convenient, Average of Cost

Table 4.3(p) demonstrated the regression model in comprehensive summary. It consists of four independent variables: Security, costs, convenience, and Reliability, Usage intention is the dependent variable in this study. The correlation coefficient R is 0.751 which showed linear relationship between the four independent variables are a positive and strong. Meanwhile, the R-squared was 0.564, indicating that 56.4% of the variance in usage intentions could be attributed to the four independent variables.

Table 4.3q ANOVA model on Security, costs, convenience, Reliability and Usage Intention

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	96.310	4	24.077	48.800	<.001 ^b
	Residual	74.502	156	.493		
	Total	170.812	155			

a. Dependent Variable: Average of Usage intention

b. Predictors: (Constant), Average of Reliability, Average of Security, Average of Convenient, Average of Cost

In the above table. ANOVA presented the value of sig. is <0.001 which is less than 0.05 means the regression model is significant. This shows R-square is greater than 0 in terms of the predictions can be account in the amount of variance in usage intention.

Formula can form a $F(4, 156) = 48.8, <0.001, R\text{-square}=0.564$. That means the significant in overall regression.

Table 4.3r Regression Coefficients on Security, costs, convenience, and Reliability, and Usage intention

		Coefficients^a				Collinearity Statistics	
		Unstandardized Coefficients		Standardized Coefficients		Tolerance	VIF
Model		B	Std. Error	Beta	t	Sig.	
1	(Constant)	1.149	.342		3.358	<.001	
	Average of Security	.413	.064	.472	6.476	<.001	1.836
	Average of Cost Negatively	.002	.090	.002	.021	.983	2.787
	Average of Convenient	.218	.084	.208	2.604	.010	2.209
	Average of Reliability	.190	.095	.182	2.002	.047	2.871

a. Dependent Variable: Average of Usage Intention

In Table 4.3(r), it showed the significance values of the variables security convenience and reliability are in the statistically significant level which less than 0.05. It is indicated that these variables can be relied upon on this model. While cost has a significant value in 0.983 which is greater than 0.05. (UCLA, n.d.) It implies the variable are not statistically significant which is not reliable in the model.

Variance Inflation Factor (VIF) is an analysis measures of multicollinearity in regression. It assists to indicate the degree of the impact of multiple variables on a specific outcome and the Correlations between multiple independent variables in multiple regression models. (Investopedia, 2023) If VIF equals to 1 means there are no correlations, while VIF falls between 1 and less than 5 means in a moderate correlation. However, if VIF is greater than and smaller than 10, that means there are highly correlated. Shrestha (2020) mentioned VIF is 10 or above means that is weak regression coefficients in multicollinearity. In this study, VIF for Security, cost, convenience, and reliability are 1.836, 2.787, 2.206 and 2.871, 2.54. The values are larger than 1 but smaller than 5 means a moderate correlation and in an acceptable range, which showing there is no significant issue in multicollinearity.

Table 4.3s Collinearity Diagnostics

Collinearity Diagnostics ^a								↵	
Model	Dimension	Eigenvalue	Condition Index	(Constant)	Variance Proportions ^b				↵
					Average of Security	Average of Cost	Average of Convenient	Average of Reliability	↵
1	1	4.932	1.000	.00	.00	.00	.00	.00	↵
	2	.030	12.749	.32	.63	.00	.01	.00	↵
	3	.018	16.527	.64	.32	.10	.06	.12	↵
	4	.012	20.500	.05	.02	.42	.72	.01	↵
	5	.008	25.004	.00	.03	.48	.21	.87	↵

a. Dependent Variable: Average of Usage intention

In table 4.3s, the sources of collinearity and the analysis attempts to extract irrelevant dimensions from collinearity. Regorz (2020) mentioned that if collinearity were not present, all these dimensions would contribute meaningfully to the amount of variation in the data set. According to the condition index in the aboved table, most of the dimensions exceeds 15, but the Variance Proportions is below 0.9, and there is no collinearity problem. However, it might have collinearity problem in dimension 2 while Variance Proportions is below 0.9 and less than 15 in Condition Index. (Kim, 2019)

Table 4.3t Residuals Statistics

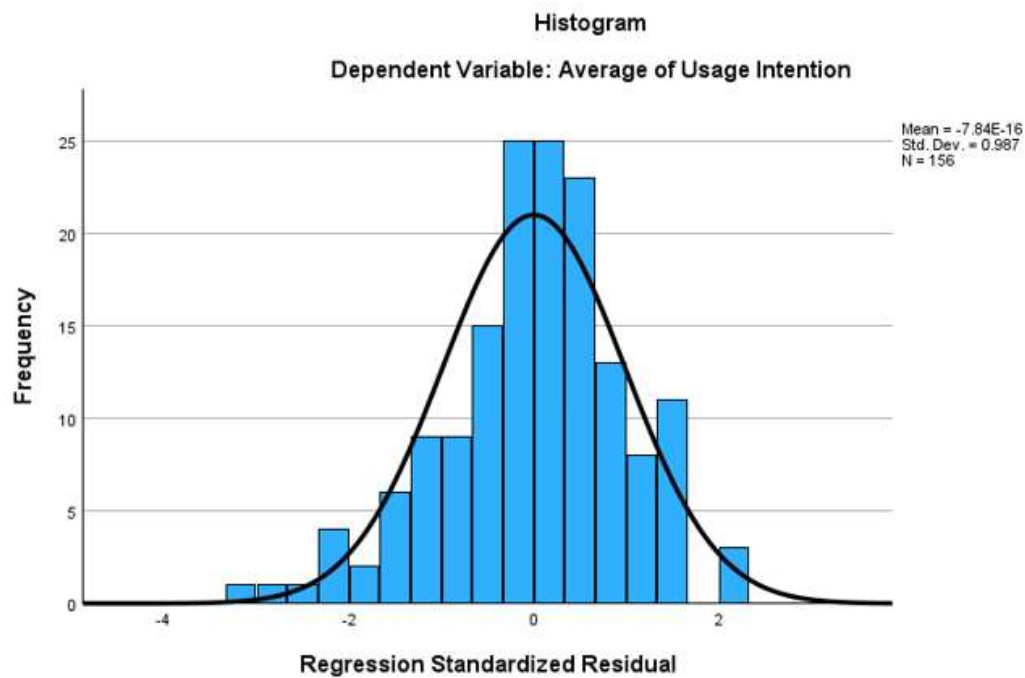
Residuals Statistics ^a					
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	3.0637	6.9083	5.3766	.78826	156
Residual	-2.14865	1.60761	.00000	.69330	156
Std. Predicted Value	-2.934	1.943	.000	1.000	156
Std. Residual	-3.059	2.289	.000	.987	156

a. Dependent Variable: Average of Usage Intention

From table above, the residual is the vertical distance between the data point and the regression line. Each data point has a residual. If the value is above the regression line, the value is positive, the value is negative if there are below. If the regression line passes through that point. The residual at this point is zero. (Tuovila, 2023) In the report, the minimum residual value is -2.14865, the maximum value is 1.60761, the mean is 0.00,

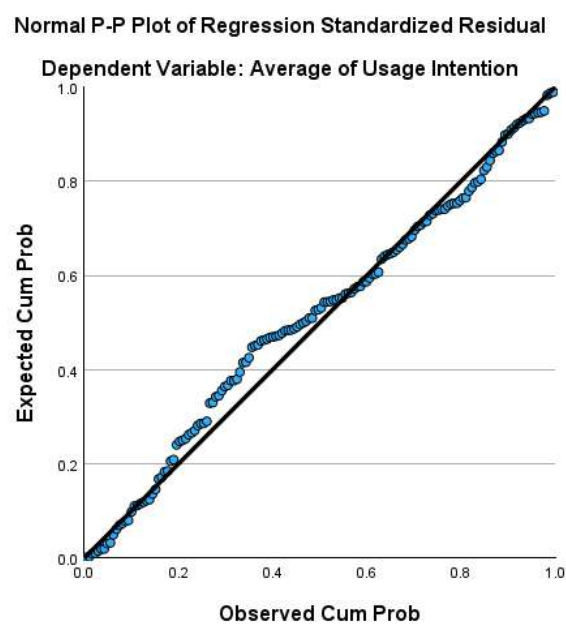
and the standard deviation is 0.69330.

Figure 4.3u Histogram



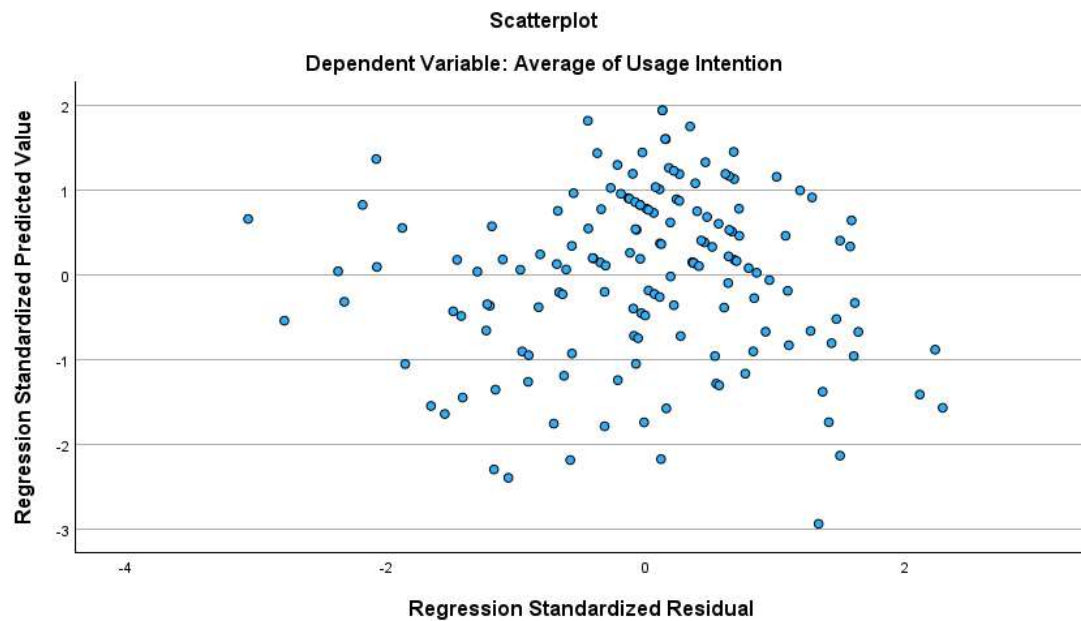
The histogram in Figure shows the normal distribution of the standardized residuals of the regression model within the bell shape.

Figure 4.3v Normal P-P Plot of Regression Standardized Residual



As can be seen from Figure, there is a significant positive correlation between safety, cost, convenience and reliability and intention to use.

Figure 4.3w Scatterplot



On the scatter plot of Figure 4.3w, it is observed evenly and randomly in the distribution of the residual values which means the errors are independent and is not related to each other.

4.4 Discussion and Results

The following linear regression model equations are the results of analyzing the safety (S), cost (C), convenience (CV), reliability (R), and intention to use (UI) variables.

$$UI = 1.149 + 0.413(s) - 0.002(C) + 0.218(cv) + 0.190(r)$$

It revealed that the residents are concerned about the security, convenience, and reliability over the usage intention. They consider security is the highest consideration. However, Cost is not showing any effect on the usage intention.

The analysis revealed the result of the hypothesis that security, convenience, and reliability are significant in the value is not more than 0.05 in table 4.3m. There is no doubt that the finding proofed the hypothesis and accepting H1, H3 and H4 means the security, convenience and reliability are positively related to usage intentions. While there is 0.984 in P-value of costs negatively inducting relationship to usage intentions, and the H2 hypothesis is being rejected.

Table 4.4a Overview of Hypothesis

Hypothesis	Regression Coefficient	Sig. Values (P-values)	Analyzed Result
H1: S to UI	0.413	<0.001	Supported
H2: C to UI	0.002	0.983	Not supported
H3: CV to UI	0.218	0.010	Supported
H4: R to UI	0.190	0.047	Supported

Therefore, the decision-making process regarding assumptions in following section.

4.4.1 H1-H4 Hypothesis

This part will demonstrate the results of the analysis which according to the Hypothesis sets in Section 2.1. The hypothesis is set based on to investigate the reasons to influence the usage intention of SBT.

Table 4.4b Hypothesis Testing on Decision Making

Hypotheses	Decision
H1: A positive relationship exists between security and Usage intention for SBT in buildings	Accepted
H2: A positive relationship exists between Cost and Usage intention for SBT in buildings.	Rejected
H3: A positive relationship exists between convenience and Usage intention for SBT in buildings	Accepted
H4: A positive relationship exists between reliability and Usage intention for SBT in buildings	Accepted

Based on the result in table 4.3o, the study result is easy to understand. Cost is the only factor that will not influence the intention to use of SBT in residential building in the mind of residents. It means the respondents will not choose to use SBT prioritize based on cost factor. In the contrast, security, convenience, and reliability are showed the significantly influence the respondents to accept the use of SBT and is revealed the relevant hypothesis are final determined.

In conclusion, cost is not the factor to drill into and to influence the usage intention of SBT, while the company can work on the other variables to increase the usage.

Chapter 5 Conclusion and Recommendations

5.1 Conclusion

This part will conduct the conclusion from the analyzed in Chapter 4. This part will give a constructive recommendation to the company. For this study, it is to assist to increase the usage of SBT in residential buildings over HHH company. In the following part, the conclusion will be draw and give recommendations and give strategies to HHH. As mentioned in Chapter 1, the usage of SBT is the universal trend, HHH should adopt and to take the chance to lead again. As proved the increase in the value-added services will increase the value and the brand image. And it is to increase the brand image. (Sanderson and Read, 2020)

5.1.1 Discussion

As showed in table 4.3o in section 4.3, the R-square of security in H1 is 0.413 with significant value <0.001 , convenience in H3 is 0.218 with significant value 0.010, and reliability in H4 is 0.19 with significant value 0.047. These all showed the possibility of the hypothesis which all have a positive relationship exists between usage intention for SBT in buildings. And the results are confirmed in this study. However, cost is the one which failed in the test with only 0.002 in reliability and with significant value 0.983. It showed it is not valid in this hypnosis.

Among the 156 respondents in the survey, it revealed the factors that meet the needs of residents to use SBT. This indicates that the security, convenience, and reliability are the common reasons for citizens to use technology which are very familiar in the post-covid era nowadays. However, cost is not the factors affect use of SBT. Therefore, other factors such as security, convenience and reliability stand as important role in determining residents' intention to use SBT.

In this connection, H1, H3 and H4 are supported based on this research which valid from the collected survey data through the questionnaire; and these are proved in the literature review mentioned in Chapter 2. The test showed all positive and is significant relationships among security, convenience, and reliability with the usage intention.

5.1.2 Results of Hypothesis Testing

In section 5.1.1 stated the supported hypotheses, the importance affection the usage intention to the SBT ranking as security, convenience, and reliability. As the SBT had been use for many years in foreign countries and in China which mentioned in Chapter 1, however, the use of SBT in residential in Hong Kong is still quite new idea.

5.1.2.1 Security

Among the security factor, it is interesting that it would be the easiest part that cannot passed the trust test at the beginning. Surprisingly, it is the most important factor to affect the intention to use SBT. In Chapter 2, security is defined in two meanings, one is the actual protection of the physical buildings and second is the internet security based on personal information. Showed in the table below, neither both types of concerns, the importance of the security is still high in the usage intentions. Among the 115 from the total 156 responds, the high-income group are treated important security using SBT as 95%, 100% and 84% in income over \$50,000, \$40,000, and \$30,000 respectively.

Table 5.1a Security concerns affect usage intentions in SBT VS Monthly income

	<\$10,000	\$10,000- \$19,999	\$20,000- \$29,999	\$30,000- \$39,999	\$40,000- \$49,999	>=\$50,000	
Slightly Agree	2	5	7	3	2	4	23
Agree	7	11	8	8	2	9	45
Strongly Agree	9	13	10	5	2	8	47
Total	18	29	25	16	6	21	115
Ratio	15.65%	25.22%	21.74%	13.91%	5.22%	18.26%	100%
Ratio to total in its group	64%	63%	71%	84%	100%	95%	--

As long as the high-income citizens are concerned about the security which is not trust in the SBT till now. The high-income group or high educated persons are more unwilling to trust technology. (Guedes and Martins and Cardoso, 2022) For example, the richest group in Hong Kong, they will trust the human than the technology.

Table 5.1b Hypothesis discussion on security

Hypothesis	Drivers	Match (Y/N)	Reasons
H1: A positive relationship exists between security and Usage intention for SBT in buildings (Accepted)	1. Technology matures.	Y	If there are concern on the personal information and the internet security, the use of sbt would be control by the tenants themselves evet they are not at home like those smart homed devices. Granting access to the visitors and the vehicles by generate the access from the tenants also possibilities in the on technology. Furthermore, the SBT APPS are developed by HHH itself which run by the innovation departments. There will be a consent from the tenants before the usage for knowledge the information is used inside the operations of the buildings only. As PM will have the details of each unit, the protection of the resident's confidential information would be enhanced. This is necessary to increase the security encrypt of the SBT.
	2. Shortage in labour	Y	Since the difficulties in recruiting applicants and keep outstanding vacancy or use higher rate to out-sourcing those non-skilled or and not familiar with the situations of the occupants' buildings to stay for short period, in terms of courtesy, the temporality staffs will usually grant access to those noisy persons willing pretend as tenants. Resulted in unfamiliar in procedures, and the suspicious person can access to the building easily.

			Besides, there are some special needs and procedures may need to carry out, while temporary staffs may not know the importance of the actions or cannot got it, thus compliant my results.↵ So, it is one reasons that the residents should take this to replace the brain drain. ↵ ↵ Furthermore, CCTV footage can increase to level of detect someone <u>fall down</u>, people with prolong stay, people gathering, climbing to guard rail which is used overly in China. ↵
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Thus, the positive relationship exists between convenience and Usage intention for SBT in buildings.↵

↵

5.1.2.2 Convenience

Based on the research results, convenience is also the important factor to continue to keep using the SBT. As Hong Kong is a fast-paced city, need quick-response, and easy to use in all the APPS nowadays. If the connection is slow, difficult to use or even cannot response instantly, that will affect the continuous usage intention of the technology. It highlights the importance of a positive and trustworthy convenience attract and retain customers. It is important consideration for residents, as knew it is the trend to use as a way of life. Accurate, quick, and efficient of fast-living speed the life of modernized Hong Kong. So, the level of convenience will really affect the intentions to use the SBT.

Table 5.1c Hypothesis discussion on convenience

Hypothesis	Drivers	Match (Y/N)	Discussion
H3: A positive relationship exists between convenience and Usage intention for SBT in buildings (Accepted)	1. Technology matures.	Y	Mobile connection, digitalization is the modern way of our life. The way of spreading information and the way to get the relevant information go viral. One connected device can access to all information needed for our lives. So, it is needed to also improve the way of living for residential, HHH also have an APPS used in commercial buildings in San po Kong as the entrance access card instead of the RFID card. It will also match the life of modern citizen to have all things in on mobile. IT will increase the convenience for the residential
	2. Shortage in labour	Y	With the self-register access, there are also granting access to the visitors and visitor vehicles to enter the buildings, other than that. The AI chatbox and the instant reply can also quickly reply to the initial needs for the general messages of the residential through the data sets instead of waiting for the reply call. Workflow management and document sharing in office administration allows quicker message circulation. Work order system allows a smooth operation in deliver over departments.

In the case of Wetland, HHH used their own developed apps to control the overall life living there which provide an easier life for residents. (SHKP, n.d.) The hypothesis in H3 is accepted.

5.1.2.3 Reliability

As reviewed in the result, the hypothesis is proved in the positive relationship between reliability and the usage intention. Since the SBT had been used in smart home and Commercial building for many years. And it had been also a selling point for the newly built building. The extension of the control will be more trustable when it goes digital and online.

Table 5.1d Hypothesis discussion on reliability

Hypothesis	Drivers	Match (Y/N)	Discussion
H4: A positive relationship exists between reliability and Usage intention for SBT in buildings (Accepted)	1. Technology matures.	Y	Proptech had come to 3.0 which had been continuous improved in various parts, in construction, (SHKP site are using) And the use of SBT had been used in the commercial, hospitality buildings, like lifts, access control, MCAV system, air-quality system, external lighting systems, etc. These are all showed a steady and stable improvements. As view the case in China, SBT is developed into a sound foundation level. Smart devices in healthcare products also have a remarkable result in human life. Preventive measures are used over in the building with BMS, IOT system with the input data and give the alert people. If there are people in needed for special-aided equipment/ electrical medical equipment, CALL-ON-SERVICE for elderly people linked to the centralized control security center. Using SBT for clubhouse services reservations and food-ordering.

	2. Shortage in labour	Y	As mentioned in reason in H1, if the staffs are outsourced with no loyal and responsibility that will not be familiar with the operations and tenants there. It may result in the low trustable level of residents for the services of the pm. It also allows Security & access management in CCTV and some access systems which also used in some site.
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Recent research showed that the technology can replace the repeated and dangerous like cleaning the external wall for people. And the advanced technology will show more accurate calculations for the humans.

5.1.2.4 Cost

Although it is the first reasons that to start the use the SBT to relieve the higher staffs cost and the cost on the increasing operations costs in energy consumption, however, the hypothesis in H2 is rejected. It is believed that the average of the income of the residents living in the private housing is medium. Besides, the SBT applications are the innovations part of each of the PM in the industry. It is believed that will not be the high initial costs. The techniques of the SBT had been mature in SBT, so the cost will not be a problem in the case.

Table 5.1e Hypothesis discussion on cost

Hypothesis	Drivers	Match (Y/N)	Discussion
H2: A positive relationship exists between Cost and Usage intention for SBT in buildings. (Rejected)	3. Technology matures	N	Cost is one the concerns for the residents to use to in SBT. Since industry revolution 4.0 and Protech 3,0 already is this moment, the technology had been improved a lot with lower cost and higher techniques.
	4. Shortage in labour	N	The keep out-sourced security staff is the way to solve the problem, but it will raise the concern of the security. So, in front of the most important concern, cost is not the point that need to consider.

Furthermore, the staff cost of security could be replaced by the SBT, as proved, and operated during the time of COVID-19. And the shortage of labour resulted in continuous difficult to recruitment, so the posts need high cost outsourced. Nevertheless, this shows no direct relationship with this factor to the residents' usage intention.

5.2 Recommendations

This study investigates factors influencing SBT use based on residents' perspectives. In the literature review process, there are fewer journals and reviews from this perspective. For the benefit of the industry, this study attempts to exploit the main effects of safety, cost, convenience, and reliability from residents' perspective. It is recommended that further researchers identify other factors influencing use to further understand barriers to the use of SBT. The survey also included some on-site face-to-face interviews with residents living in buildings using SBT near wetlands to better clarification and understanding. Lefever, Dal and Matthíasdóttir (2007) suggested to have online surveys and face-to-face interviews together to gain the complete understanding of usage intentions. Ferguson, James, & Madeley (2002) mentioned to improve the accuracy and consistency of studies, it is suggested to strive the larger sample sizes with ideally in 400 respondents in consider five variables. The representative will be more accurate in grasp of various characteristics of participants, resulting in greater support utility and confidence in the results.

Furthermore, this study will dispel misconceptions among practitioners when implementing SBT, and when they implement the policy, the mindset will change as it is the milestone for the industry and Hong Kong.

The goal is to increase the desirability of the use of SBT for residential buildings and to provide industry with the inclusivity, accuracy and flexibility of upcoming surveys. By considering the following suggestions, researchers can broaden the boundaries of knowledge and provide important perspectives to professionals in industry.

Based on section 5.1.2.1, the disclosure of the confidentiality, which could be solved by gathered consent before the usage of the SBT and the inform the users about the policies of the restrictions of the data for official users at staffs. Second, is the security level of the high-rank and low-density buildings. It is suggested to have a whole review of all the buildings managed by HHH into different levels with updated different occupants' details based on different locations, buildings size and style.

Additionally, review the needs of job positions and vacancies in existing operations and staffing across different ranking of the buildings. To better utilize of resources, replace

those overlapped positions. For the high-ranking buildings, to provide with the bodyguards or Gurkha guards in random patrol in buildings, or even station in each tower. For the low-ranking buildings, replace the positions with the SBT directly supported with skilled patrol guards.

Pinned the point in section 5.1.2.2, PropTech had been the trend. To better go with the tide, technology in all around is our current lifestyle. Instant reactions with solutions and non-face-to-face interactions are the current lifestyle of this generation era. So, the use of PropTech with the new AI functions will also increase the favorable impression of the brand, which meet the values of HHH in focus in customer with Innovation at Quality Service to result in Best Value services (HHH, n.d.)

The above recommendations are also specific to HHH as it aims to provide differentiated customer service. If the recommendations are taken into consideration, it is believed that intention to use will increase. The use of SBT can be used in marketing to promote consistency with their brand image and vision using the 8Ps.

Table 5.2 Recommendations on promoting the use of SBT in marketing mix

Marketing Mix	Recommendations
Planning /Positioning	1. To find out the target market and the demography. Updating with the tenant's information by demographics, income categories or age groups or family life cycle. For instance, middle-income group with young couples, or high-income group with retired persons, or low-income group with retired persons, etc. 2. To find out the specific needs for different target markets. Priority the needs of different groups, the digital literacy, healthcare needs, personalized services, housekeeping services.

People↵

3. To match the current tide which people should work with technology. Hiring with technology literacy candidates instead of just only holding SPP, the selection and recruiting should be more aware of the knowledge of ~~sbt~~ usage. HHH is only the security company is the one leading the industry. So, the title of the job positions should be renamed. ↵
4. To streamline the organizational structure of the buildings, paperwork and administrative data entry work should left for SBT↵
5. Put more resources in interpersonal skills and customer service with a focus towards customer satisfaction for the ranking of high-income group buildings allowed a personalized and customized services ↵
6. Re-allocate the resources in training for the SBT use over the buildings, giving more educations to all staffs about the ~~sbt~~ using even the headquarters.↵
7. Giving agreement to staffs for the use of the personal information and details are confidential, if any disclose will treat as misconduct.↵

Products↵	8. The SBT should have a better ICT connection to the centralized security control with 24/7 operations at each site. ↵ 9. Continue to develop and improve the current SBT APPS or reinforce with SBT process procedures. ↵ 10. Review the possibility and feasibility of all kinds of sbt installations in different ranking buildings. ↵ 11. Develop the instant <u>reply</u> AI ~~chatbox~~ and autoreply in APPS with some general data or answer to provide first-hand customer services to all users↵ 12. If there are people in needed for special-aided equipment/ electrical medical equipment, CALL-ON-SERVICE for elderly people linked to the centralized control security center.↵ 13. Added-on services on reservations on clubhouse services and food-ordering. ↵
Price↵	14. Innovation cost of the sbt APP will be borne by the PM and the connections of the APPS will not be an issue. And the installation of the equipment will be installed step by step. The cost should be reallocating the sources from the advanced technology usage and cut off the unnecessarily departments. Price for the installations for current buildings should compared based on the market prices.↵
Place ↵	15. Implementation step by step in all the buildings in different ranking in all access entrance doors, Self CCTV surveillance, facial authorization, RFID access and OCR carpark entrance↵

Promotion [↵]	16. Forming a committee and keep uplifting the information to all buildings, in the internal circular, that is must present item in the regular meetings to clients, sharing with any special booths or even notice board with special activities. To build as a need in the future, and the mind of “People have it, so do I” which means missing. ESG and energy and waste management <u>is</u> the key for the future as the selling point (Lee <i>et al</i>, 2024) The use of SBT will increase the value of the property. (Hunter, 2024)[↵] 17. Promote the advantage and the use of SBT in buildings in social media and using the search engine optimization (SEO) for Gen Y and Digital Native. for instance, social media in Facebook, Instagram, Linkin. It also can cooperate with different KOL in some different targeted groups. It is target to Digital Native to align with the brand image and the personalized lifestyle of current era.[↵] 18. For Gen X, can promote as the customer needs and Gen Y can use the concept of personalized for personal needs. (Kotler et al, 2021) Transit advertising in MTR and Bus is also a way. [↵] 19. For the specialty target group, “Sliver-hair” Market which in rich and the consumers’ spending power is high. (文化村,2021)They need some guidance to use technology. (Now, 2024 a, Now, 2024b) They are the group of social and being awareness of their existing needs. (Wat, 2024)[↵] 20. Introducing to public like advertisement in professional groups, newspaper with all range usage of SBT in the portfolio. Organizing sharing successful sharing session for industry, to improve the image of its USP of the image.[↵]
Process [↵]	21. Have the whole plan to the execution. To plan the whole review assessments and the current staffing. Second, is to reinforce the current products with enhancement to stand out is USP. [↵] 22. Keep uplifting with the committee for different users to promote the usage for different users to promote the usage with the KPI in regular meetings in usage of the SBT within HHH <u>through</u> the promotion in social media and notices. Each building should provide KPI with designated action plan by the committee

	enhance customer satisfaction after receiving the enhancement, streamline operations, and optimize the customer journey.↵ 23. Communicate with the residents the reasons of reduce the cost and increase the security control of the buildings. Propose in regular meetings to tenants in regular meeting that the current drivers of the situations of this industry. The kind of present can be used in the internal office first to show them the result. And provide with all the possibilities with outcomes to them. There will be in different phases to execute.↵ ↵
Physical evidence. / Performance↵	24. Review the possibility and feasibility of all kinds of SBT installations in different ranking buildings. ↵ 25. Showing the successful evidence for residential area in wetland, and the commercials in Wong Chuk hang and San po Kong in public relations parts.↵ 26. Using viral/ online to promote the user experience the use of SBT as content marketing increase online reputation.↵ ↵

With better marketing, it will be increasing confidence of the use in SBT which allows the residents believed that is the supreme services provided by HHH. Thus, Brand image will gradually increase, and the image will differentiate with other PM. Thus, HHH will regain the lead positions again and continue to contribute to the industry. ↵

Among the industry, the ~~sbt~~ and the building apps had been self-developed by the PM as the innovated items to push the company forward by increasing the competitiveness.↵

With the points ~~aboved~~, HHH is going to transform the leading positions of the industry. With using the market strategies. HHH will this new project holding since 2015, but it could be upgraded to net level and open its possibilities to all coverage of the media reach its targets and publics. With tackle with the resulted found in this study, and the recommendations ~~aboved~~, it is believed that HHH would increase the most Ideal and Advanced customer services in its professionalism experiences for Customer's Lifestyles and Needs resulted upgrade the reputation. (HHH, n.d.) Thus, the increase in brand image will gradually increase again. ↵

5.3 Managerial Implication

In the view of strategies and directions of HHH, the brand image and strategies are matched with its Vision, mission, and values. While there are some points should be notices.

5.3.1 Developed and investment in innovation enhance Technology improvement

Ongoing contributions to technology development or innovation. It changes every day. HHH should live up to the vision mentioned. It is necessary to further increase the sustainability of SBT improvements to maintain the industry's comparative competitiveness. PropTech has become a new competitive market in the industry. Maintaining the vision of Asia's best and most innovative property and facilities management company. (HHH, n.d.) HHH should jump on this trend to maintain its market leadership. In concept, star support in the BCG Matrix and will change to cash cow over time (Boston Consulting Group, 2014) This is a necessary component to compete in the industry. To establish the consistency of the brand image of innovative enterprises, the need to be sustainable also important in the minds of customers now. (Instagram, 2023) This needs to be reinforced.

5.3.2 Improvement company Image and Logo

Furthermore, we are technically in a digital world and the target markets are all technically itinerary. Easily search the history and website through SEO. Therefore, to increase market share, HHH first improve our brand image. To align with the vision, HHH should show welcome changes in the website, content and even brand logo. Additionally, increase SEO visibility by telling customer experience stories to capture the attention of your target customers (DBS BusinessClass, 2024, Lee, 2024, Instagram, 2023). In terms of internal culture, the USP – an innovative subsidiary is emphasized. Therefore, the public will realize that the USP and brand of HHH is the innovative SBT PM. These measures will increase residents' confidence in innovative businesses.

5.3.3 Human Resources Department

Brain Drain is the common phenomena in Hong Kong since 2020, shortage of labour happens in different industries. (HKSAR Press Release, 2023) PM is one of the traditional industry having difficulties in recruitment as the low status and income jobs affects the new generations to join. As time passed, SBT can assist to the shortage of staff and the low-skilled positions. To tackle the problems of brain-drain in the middle level, which is the serious problems since 2020, so the policies should change to re-hire the previous talented staffs. As this kind of practices hinder the “high “quality management and talent to other our professional peers. (HHH, 2023a, Manpower Group, 2024a, Manpower, 2023b)

In addition, since there are IoT implant courses on the market, HHH can also cooperate with schools to offer QF courses to increase the retention of technically qualified talents in the company. (HKCT, 2024) This will improve the HHH's overall competitiveness and transform the company from security management to facilities management.

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In the conclusion, the use of SBT should be promoted through marketing concepts.

5.3 Limitation and Further Study

This study only surveying 156 participants, it was found that the SBT has fulfilled the requirements of the survey. It is just meet the customers' usage intention requirements. The study indicates that current strategy's on SBT and the brand are just adequate. It is worth noting that residents in the Hong Kong do not consider cost to be the main factor in choosing SBT but are very concerned about security. Therefore, other factors such as convenience and reliability play a more important role in determining residents' choice of SBT. Thus, this could be the initial survey for the further researchers to develop on the usage of SBT.

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你一定要明白佢哋嘅心理需要，就係「需要關懷協助」及「解除苦悶」...: By Ken Wat, 你的網店教練facebook Available at:

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The study of the factors affecting Residents in Hong Kong to use Smart Building Technology 影響香港居民使用 智能大廈科技的因素研究

你好!

本人現正於威爾斯三一聖大衛大學就讀工商管理碩士。現正進行一份關於

影響香港居民使用智能

大廈 科技的因素的畢業論文研究。

建築物中使用的

智能 大廈 科技 不僅限於非接觸式開門按鈕、透過智慧卡或臉部辨識的自動門、透過行動應用程式控制家庭設備、入侵警報系統、門禁系統、遠端閉路電視以及對入口的存取即時反應，防止擅自闖入，自助訪客登記申請，訪客停車二維碼由佔用者生成，機器人巡邏系統，保安機器人，清潔消毒機器人，透過物聯網系統連接的機房感應，透過指定的即時回覆樓宇新聞應用程式、自動回覆AI、聊天框等。所有用於建築和連接的技術都可以定義為

智能 大廈 科技 。

以下調查問卷將有兩個部份，所需時間為 5-10 分鐘。

在第一部份中選出正確答案，第二部份中請在正確的答案中畫上剔號。

此問卷調查需年滿16歲或以上及居住在香港之人士，並採取匿名方式填寫。而 閣下所提供的資料亦只作為學術研究分析之用，不會對外公開或用作商業用途，此問卷及所提交資料將會在6個月後銷毀。

敬請放心填寫，多謝合作。

Hello!

I am a student who studying in Master of Business Administration, MBA in University of Wales Trinity Saint David. I am now conducting a dissertation research on the factors affecting Residents in Hong Kong to use Smart Building Technology.

Smart building technologies used in buildings are not limited to contactless door opening buttons, automatic doors through smart cards or facial recognition, control of home devices by mobile application, intrusion alarm systems, access control systems, remote CCTV and instant react on access of the entrance to prevent unauthorized access, self-serving visitors registering applications, visitors parking qr code generated by occupants, robot patrol systems, security robots, cleaning and disinfection robots, and plant room sensing connected through IoT systems, real-time reply to building news through designated applications, automatic reply AI, chat box, etc. All technology used in building and to connect can be defined as smart building technology.

This questionnaire will have 2 sections which only spare in 5-10 minutes.
Please choose the correct number in Section 1 while please put a tick into the correct answer box in Section 2.

The respondents of this questionnaire must be at least 16 years old or above and who live in HK, and it must be filled out anonymously. This questionnaire and submitted information will be destroyed after 6 months.

All the information collected will be kept confidential and for academic purpose only.

Your opinion will be very useful to us.

Thank you for your cooperation.

Section 1 第一部份

This part contains of 22 questions about the opinions of smart building technology.
這部分包含22

題 關於對

智能大廈科技的看法。

Q1. S-

*

I agree that safety is the most important reason that I choose to use smart building technology.

(1- Strongly disagree, 7-strongly agree)

我同意保護/安全是我選擇使用 智能大廈 科技的最重要因素。

(1- 強烈不同意, 7- 強烈同意)

1

2

3

4

5

6

7

☐☐☐☐☐☐☐

Q2. S

I agree that Smart Building Technology can security for the property.

(1- Strongly disagree, 7-strongly agree)

我相信 智能 大廈 科技 可以保障財產安全。

(1-非常不同意, 7-非常同意)

1	2	3	4	5	6	7
☐	☐	☐	☐	☐	☐	☐

Q3. S

As human kind amy affected by emotions to make wrong decisions, so technology will better in safeguard my building.

(1- Strongly disagree, 7-strongly agree)

由於人類容易受到情緒的影響而做出錯誤的決定, 因此 智能 大廈 科技 更能保障我的居住大廈和財產安全。

(1-非常不同意, 7-非常同意)

1	2	3	4	5	6	7
☐	☐	☐	☐	☐	☐	☐

Q4. S

I agreed that the Smart building technology can protect personal info and history.

(1- Strongly disagree, 7-strongly agree)

我同意 智能 大廈 科技 可以保障個人資訊和歷史記錄。

(1-非常不同意, 7-非常同意)

1	2	3	4	5	6	7
☐	☐	☐	☐	☐	☐	☐

Q5. S

I agree that smart building technology can protect the building well and better than human.

(1- Strongly disagree, 7-strongly agree)

我同意 智能 大廈 科技 比人類更能保護居住大廈和財產安全。

(1-非常不同意, 7-非常同意)

1	2	3	4	5	6	7
☐	☐	☐	☐	☐	☐	☐

Q6- C

I agree smart building technology will reduce cost because of the preventive alerts and to takes any measures to refecify the defects before the huge costs in replacement work.

(1- Strongly disagree, 7-strongly agree)

我同意 智能 大廈 科技 會將降低成本。由於有預防性警報提醒, 可以在產生巨額更換成本之前, 採取措施重新修正缺陷。

(1-非常不同意, 7-非常同意)

1	2	3	4	5	6	7
☐	☐	☐	☐	☐	☐	☐

Q7. C

I believe smart building technology will solve the shortage of headcounts.

(1- Strongly disagree, 7-strongly agree)

我相信使用 智能 大廈 科技 會解決人手短缺的情況。

(1-非常不同意, 7-非常同意)

1	2	3	4	5	6	7
☐	☐	☐	☐	☐	☐	☐

Q8. C

I believe the use of Smart Building Technology will result in slow down the trend of increasing in management fee on long-run.

(1- Strongly disagree, 7-strongly agree)

我相信從長遠來看，智能大廈科技的使用會減緩管理費上漲的趨勢。

(1-非常不同意，7-非常同意)

1	2	3	4	5	6	7
☐	☐	☐	☐	☐	☐	☐

Q9. C

I believe the use of Smart Building Technology will decrease the cost spend on routine and repetitive work. Management can have time in analyze to the high level decisions.

(1- Strongly disagree, 7-strongly agree)

我相信使用智能大廈科技將會減少日常工作及重複工作引產生的成本，管理人員可以進行高階之分析及決策工作。

(1-非常不同意，7-非常同意)

1	2	3	4	5	6	7
☐	☐	☐	☐	☐	☐	☐

Q10. C

I believe the value of property will raise if use Smart Building Technology .

(1- Strongly disagree, 7-strongly agree)

我相信如果使用智能大廈科技物業的價值將會提高。

(1-非常不同意，7-非常同意)

1	2	3	4	5	6	7
☐	☐	☐	☐	☐	☐	☐

Q11. CV

I believe the use of Smart Building Technology will smooth the flow of current operations of buildings.

(1- Strongly disagree, 7-strongly agree)

我相信使用 智能大廈科技 的運用將使居住大廈目前的日常運作流程更加順暢。

(1-非常不同意, 7-非常同意)

1	2	3	4	5	6	7
☐	☐	☐	☐	☐	☐	☐

Q12. CV

The interfaces of the system of Smart Building Technology will affect my intentions to use.

(1- Strongly disagree, 7-strongly agree)

智能大廈科技系統應用的介面會影響我的使用意圖。

(1-非常不同意, 7-非常同意)

1	2	3	4	5	6	7
☐	☐	☐	☐	☐	☐	☐

Q13. CV

User friendly is the key for me to use Smart Building Technology . I agree that Smart Building Technology will easy my life as it assist me to save time to collect in the information and assist me to make quickiere decisions.

(1- Strongly disagree, 7-strongly agree)

方便使用的應用是我使用 智能大廈科技 的關鍵。我同意 智能建築科技 會讓我的生活變得輕鬆，因為它幫助我節省時間收集資訊，並幫助我快速做出決定。

(1-非常不同意, 7-非常同意)

1	2	3	4	5	6	7
☐	☐	☐	☐	☐	☐	☐

Q14. CV

Apply smart building technology to provide my visitors with an easier and smoother visitor registration process to entering the building. This helps me and makes me proud.

(1- Strongly disagree, 7-strongly agree)

應用 智能大廈科技 為訪客提供更輕鬆、更順暢的訪客登記流程。這對我有幫助，讓我感到自豪。

(1-非常不同意，7-非常同意)

1	2	3	4	5	6	7
☐	☐	☐	☐	☐	☐	☐

Q15. R

I believe in the reliability of the use of smart building technology in property in all level.

(1- Strongly disagree, 7-strongly agree)

我相信在 物業 的 各個層面使用 智能大廈科技 的可靠性。

(1-非常不同意，7-非常同意)

1	2	3	4	5	6	7
☐	☐	☐	☐	☐	☐	☐

Q16. R

I trust results made from the smart building technology.

(1- Strongly disagree, 7-strongly agree)

我傾向相信 智能大廈科技 運算 而得出之結果。

(1-非常不同意，7-非常同意)

1	2	3	4	5	6	7
☐	☐	☐	☐	☐	☐	☐

Q17. R

*

I agreed smart building technology can do repetitive and tedious tasks and perform better than humans.

(1- Strongly disagree, 7-strongly agree)

我同意 智能大廈科技 可以完成重複性和沉悶性的工作，並且比人類表現得更好。

(1-非常不同意，7-非常同意)

1	2	3	4	5	6	7
☐	☐	☐	☐	☐	☐	☐

Q18. R

*

I can trust the smart building technology to do the dangerous works and reduce the risk of any accidents.

(1- Strongly disagree, 7-strongly agree)

我可以相信 智能大廈科技 可以 進行危險工作，亦會減低意外的風險。

(1-非常不同意，7-非常同意)

1	2	3	4	5	6	7
☐	☐	☐	☐	☐	☐	☐

Q19. UI

*

Security concerns will affect my intentions to use smart building technology.

(1- Strongly disagree, 7-strongly agree)

保護/安全問題會影響我使用 智能大廈科技 的意圖。

(1-非常不同意，7-非常同意)

1	2	3	4	5	6	7
☐	☐	☐	☐	☐	☐	☐

Q20. UI

Cost is the most issue affecting of the willingness of the use of smart building technology.

(1- Strongly disagree, 7-strongly agree)

成本是影響 智能大廈科技 使用意願的最大問題。

(1-非常不同意, 7-非常同意)

1	2	3	4	5	6	7
☐	☐	☐	☐	☐	☐	☐

Q21. UI

User friendly is the reason for me to use Smart building technology.

(1- Strongly disagree, 7-strongly agree)

方便使用者是我 使用 智能大廈科技 的原因。

(1- 強烈不同意, 7- 非常同意)

1	2	3	4	5	6	7
☐	☐	☐	☐	☐	☐	☐

Q22. UI

I think smart building technology is a trustworthy technology.

(1- Strongly disagree, 7-strongly agree) 我覺得 智能大廈科技 是值得信賴的技術。

(1-非常不同意, 7-非常同意)

1	2	3	4	5	6	7
☐	☐	☐	☐	☐	☐	☐

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下一個

清除表格

Part 2. Personal information

This part contains of 4 questions about your personal information.
這部分包含4題有關您的個人信息。

Q23. Gender 性別 *

- ☐ Male 男性
- ☐ Female 女性

Q24. Age 年齡 *

- ☐ Aged 17 or below 17歲或以下
- ☐ 18-29
- ☐ 30-49
- ☐ 50-59
- ☐ 60-69
- ☐ Aged 70 or above 70歲或以上

Q25. Employment status Q25. 就業狀況 *

- ☐ Employed 就業
- ☐ Unemployed 待業
- ☐ Student 學生
- ☐ Retired 退休
- ☐ Housewife 家庭主婦

Monthly income 每月收入 *

- ☐ <\$10,000
- ☐ \$10,000-\$19,999
- ☐ \$20,000-\$29,999
- ☐ \$30,000-\$39,999
- ☐ \$40,000-\$49,999
- ☐ >=\$50,000

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