THE ACCEPTANCE AND POTENTIAL OF USING ROBOTICS TO PROVIDE A SERVICE TO HOTEL'S GUESTS

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ABSTRACT

Due to how the Covid-19 pandemic has impacted consumers, they now prioritize safety and avoiding the infection. In order to minimize the propagation of the virus, robot service should be utilized to provide a contactless service. This study aims to investigate Covid-19's influence on the hospitality sector as well as consumer acceptance of robots providing service to customers.

In order to do the research, quantitative research has been applied to this paper to collect the data from the samples regarding their perspective toward robot service in the hotel industry. This research has gathered 156 respondents that can be used to find the acceptance of robot service in hotels. The SPSS program was used to analyze the data from the questionnaire and perform frequency analysis, factor analysis, cross tabulation, and multiple regression analysis.

The factor analysis has demonstrated 3 components which are Interactive Experience, Hygiene & Safety, and Speed. However, there are 2 factors that customers are concerned about the intention to use robot service in hotels are Interactive Experience and Hygiene & Safety.

KEY WORDS: Hospitality Management / Hotel Industry / Artificial Intelligent / Robot service / Robot service in hotel

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CHAPTER I
INTRODUCTION

1.1 Background and problem statement

Tourism industry is one of the most important industries that generate income to Thailand as well as the hospitality sector which is a part of the tourism sector. When the opportunity occurs, it is necessary to focus on developing toward a goal. The COVID-19 pandemic temporarily shut down the economy all around the world (UNWTO, 2020). The virus has affected the hotel business and caused it to face new challenges. Most of the area has applied social distancing measures, lockdowns, work from home restrictions, travel and transportation limits, as well as other COVID-19-flattening tactics. This has caused some hotels to close temporarily, causing a significant decline in guest visiting hotels that remained in operation (Bartik et al., 2020). The hotel had to lay off employees and establish leave without pay policy (LWOP) in order to maintain key person. Moreover, a service charge is a fee paid for services related to the primary product or service purchased. Generally, the service charge is 10%. The service charge was decreasing as the number of guests significantly dropped to book a room and use a service in the hotel. The staff had fewer working hours as the hotel was not running in full operation. The Ministry of Health has promulgated a "no dining policy" to minimize the pandemic and had come up with staying at home and travel restrictions orders. This affected a significant drop in occupancy and revenue for the hotels. Although the reopening process has only recently started, the restrictions from the authorities have also been released. For instance, they now allow restaurants to operate, and people can dine-in while still adhere to social distancing measures.

The COVID-19 situation has continued to have major effects on how hotels operate, despite the industry's recovery. During the pandemic, hospitality businesses must make major changes for their opening to maintain the health and safety guide for their employees and guests as well as to boost the demand of guests visiting the hotel (Gössling et al., 2020). To generate more revenue, many hotels make an approach to

becoming an Alternative State Quarantine (ASQ) which is a quarantine process that takes place in government-approved hotels in Bangkok where bookings are paid for by guests themselves. The catastrophic issue of lacking customers remains due to lack of safety and fear of possible COVID-19 infections. People are so concerned about their health and safety that they try to minimize their interactions with others as much as possible.

1.2 The motivation for research

The research priorities of industry professionals in hotel marketing and management are one of the significantly impacted by this crisis. Due to the pandemic's new challenges for the hotel industry, the hospitality experts must refocus their research efforts to provide industry solutions. According to Doorn et al. (2016), many service encounters will adopt technology that connects service robots and humans by 2025. Hotel customers can engage, communicate, and receive services using autonomous, flexible interfaces known as robot service (Wirtz et al., 2018). Moreover, in hotels, robots will handle the department support for employees and customer services (Ivanov et al., 2017). There are several areas where robots may make contributions. For instance, intelligent service robots, such as robot concierges that may make recommendations for tourist attractions or respond to the questions immediately. Robots that are intelligent and move autonomously within confined spaces to carry goods or deliver bags to guest rooms. In addition, Hotel customers may be assisted to make reservations or manage the surroundings by the robot (Tussyadiah et al., 2020). Therefore, using the capacity of robotics and artificial intelligence to deliver service might be a good option for contactless services in this era. Besides, the robot's implementation will decrease the number of guest-staff interaction needed for visitors to check in and out. It also can help reduce service delays brought on by a staffing shortage as a result of employee layoffs at the hotel. This affects the employee's need to multitask during the low number of staff. Furthermore, using a robot to serve guests has a tendency to improve their experience. These robotic technologies will be useful in each area of the hotel such as housekeeping, food & beverage, and the front office department.

The expected outcome of utilizing robots may guide a revolution in service-based hospitality. On the other hand, customer satisfaction mainly revolves around people as it is about how to serve the customer's needs. However, automation and self-service experiences have also profited from the usage of robots in order to increase speed, efficiency, and the overall consumer experience. Rather than replacing employees entirely, hotels are using robots to increase production and make them more efficient and productive. Consequently, this research will find out about the acceptance and potential of using service robots to provide a service to hotel's guests.

1.3 Research objectives

1. To examine the effects of Covid-19 in the hotel industry
2. To study the customer's acceptance of using a robot to deliver service to customers

1.4 Value of the research

The academic implications concern the elements that affect the tourism industry's desire to utilize the use of robots to enhance the service performance. Furthermore, the study will lead to thorough understanding of the new behavior and customer's needs within the hotel industry.

The practical implications are about achieving the customer's need after COVID-19 and understanding the need for robotics in the hotel industry. In addition, this study might lead to the decision making regarding the introduction of service robots in some hotels.

CHAPTER II
LITERATURE REVIEW

2.1 Changed in the hotel industry after Covid-19

Hao, Xiao, and Chon (2020) mentioned that the hospitality industry was among the first to be severely impacted by COVID-19. However, early signs of recovery have been shown since late March 2020. These challenges are affecting stakeholders in the hotel business. Because of travel restrictions and social exclusion, the demand and accessibility of travelers have significantly decreased. In the context of COVID-19, the hospitality industry will need to develop a framework to understand and implement strategies to deal with this emerging problem. According to Hao, Xiao, and Chon (2020), the below figure is a framework for managing COVID-19 incidents in the hotel industry.

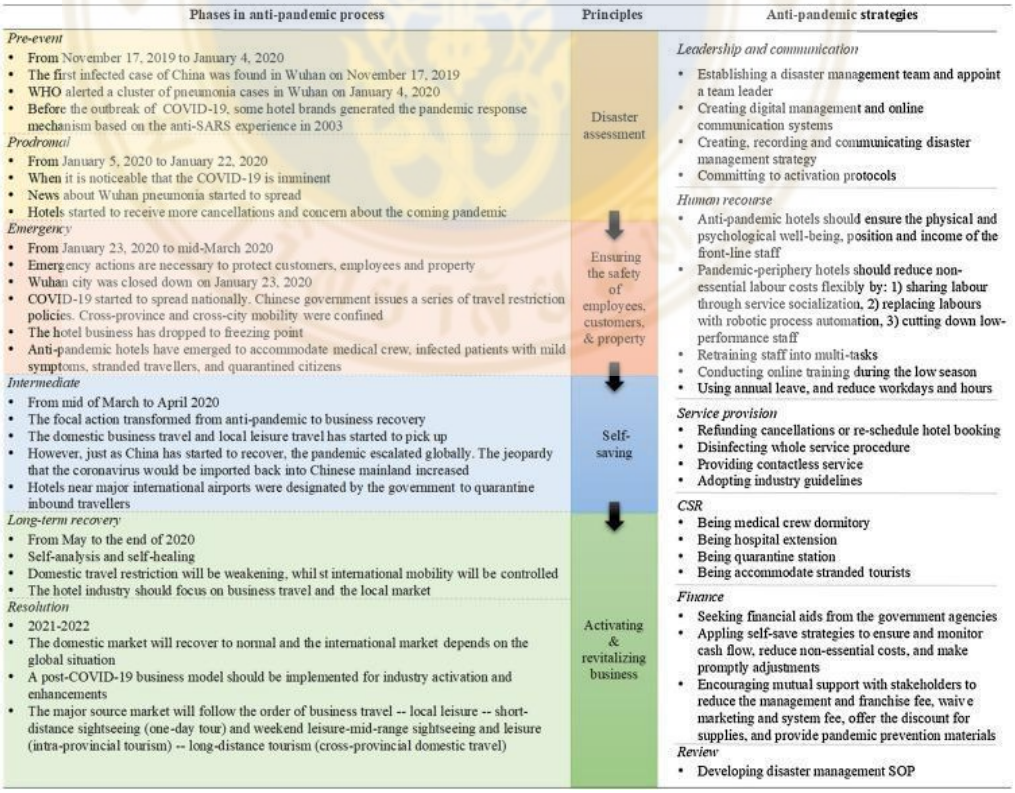


Figure 2.1: A framework for managing Covid-19 incidents in the hotel industry
Source: Hao, Xiao, and Chon (2020)

They also provide a new approach to operating in four ways which are multi-business and multi-channel platforms, product design and investment preference, digital and intelligent transformation, and market reshuffle.

Referring to Shin and Kang (2020), for risk mitigation strategies, technology advancements are crucial to the hotel industry's recovery from the COVID-19 pandemic. Nevertheless, it is unknown what effect this will have on customer decision-making behaviors. Concentrating on technological innovations to reduce guest-staff interactions and promote hygiene, the analysis about the effects of the expected interactions and cleanliness on perceived health concerns and the intention can potentially lead to customer's increased desire for bookings. Interactions using technology-based mediation systems have been found in various studies to help improve customer's perceptions of potential health risks. As a result, the intention of guests to book a hotel reservation will increase as well. In addition, the introduction of advanced cleaning technology will help enhance customer confidence in hotel bookings.

According to Jiang and Wen's (2020), there are three-dimensional research agenda for hotels concerning COVID-19 which are artificial intelligence (AI) and robotics, hygiene and cleanliness, and health and healthcare. To begin, various sorts of AI, thought-and-sense processes, may bring up new study avenues at the confluence of health and management issues. Secondly, the study advises academics to go beyond conventional viewpoints on the causes and effects of hotel hygiene and cleanliness, particularly by delving into how visitors see the cleanliness of the hotel's surface. Lastly, the in-depth analysis guarantees the relationship developed between the hospitality and healthcare sectors.

2.2 Hotel business trends

Analytics and big data are considered as an indispensable part in corporate digital transformation efforts in tourism and hospitality industries and in general. Thus, greater effort, efficiency, and strategy are put into developing new business models and accomplishing effective transformation (Evans, 2020). Big data is increasingly emerging as an outpost of company optimization opportunities. However, many organizations have not fully adopted and utilized this potential as it still remains in its

early stages of development. From the studies, among the most significant aspects in the technological, organizational, human, and environmental dimensions are relative advantage, management support, IT expertise, and external pressure. In addition, based on the research, the major influential dimension was technology (Yadegaridehkordi et.al., 2020). In the next five years, analytics and big data are expected to be among the most significant technologies affecting the industry. Furthermore, the innovative ethical data management is helpful for how the industry creates the strategy. This is to increase their sales by creating a competitive advantage through offering organizational values through their marketing activities (Abraham et al., 2019; Evans, 2020).

Strong growth forecasts for the hospitality and tourism sectors, several crucial areas will impact the competitiveness which includes using social media, developing new business models, managing risks, developing model talent, appreciating the impact of information technology, fostering employee loyalty, and using design thinking (Sanjeev and Birdie, 2019).

Robots, Artificial Intelligence, and Service Automation (RAISA) are currently being used in the travel and hospitality sector's operations. For example, self-check-in kiosks, swimming pool cleaning robots, robot delivery service, liaison officers, and chatbots. These inventions have been gaining ground in various organizations. Consequently, a revolutionary hotel service was created (Ivanov, 2019).

2.3 Robot Service

Service robots are described in a variety of ways. A robot service, according to the International Federation of Robotics (IFR), is "a robot that does helpful duties for users or equipment, except application industrial automation." (National Federation of Robotics., 2021). According to Wirtz et al. (2018), service robots are referred to as "physically embodied AI creatures capable of performing actions that affect the physical environment." Industrial automation is where robotics got off the ground. Industrial robots are designed to carry out repetitive operations with extreme speed, great accuracy, and little downtime (Jordan et al., 2013). The utility and conformity to societal standards of a technology are referred to as the functional dimension. Service robots, according to scientists, will be a big productivity platform for the service industry by

lowering labor expenses and improving service industry efficiency (Rodriguez-Lizundia et al., 2015). Most robots provide instruction, cleaning, or movement support in certain service sectors (Tsarouchi et al., 2016).

A service robot is defined as "an autonomous and adaptable system-based interface that communicates, interacts, and offers services to hotel guests.". These service robots come in a variety of shapes, including humanoids, non-humanoids, virtual assistants, and chatbots (Tussyadiah & Miller, 2019). In addition to performing routine tasks, mechanical and automated activities, customers who communicate with robot services may engage with them and get services from them (Wirtz et al., 2018). Service robots differ from conventional self-service technology due to their intelligence (Choi et al., 2020). It allows customer-engagement service robots to use relational and social-emotional characteristics (Wirtz et al., 2018). Guests often see service robots as social beings during human-robot interactions (HRI) because of these factors (Chi et al., 2020). The Sacarino, an interactive bellboy who travels with travelers and provides only the most basic services and can read pre-written information about the place, is an example of a robot service used for the hotel business (Pinillos et al., 2016). Moreover, Savioke's Relay, a system used by many hotels to schedule delivery services, also supports HRI, and can display it. Because of cameras and sensors that detect room numbers, Relay may safely navigate crowded halls and access elevators. To ensure quality control, instead of leaving tips, guests are invited to comment on Relay's performance on a screen. As soon as the system software detects favorable guest replies, Relay will vibrate its body. Relay only captures a portion of the amount of technology advancement and HRI in hotels. In order to respond with warmth at all times, service robots must be able to identify human emotions through facial expressions, body language, and conversation.

Superior service robots should operate in the same way as human employees do, with genuine facial expressions and emotional reactions (Choi et al., 2019). Service in travel and hospitality industries, robots and artificial intelligence are widely recognized as advantageous technology (Chi et al., 2020). In addition, the substantial implications these technologies may have on society, the economy, and tourism were highlighted (Craig Webster & Ivanov, 2020).

In the COVID-19 crisis, the advantages of service robots are even more obvious. Previous study has demonstrated that the COVID-19 virus has raised consumers' consciousness of the importance of social and physical distance (Wan et al., 2020). In order to diminish direct human touch, guests are more inclined to use service robots (Hou et al., 2021). With the rapid growth of robotic technology comes the possibility of changes in future workforce leadership and human resource management (Vatan et al., 2021).

Even though technology has not yet advanced to the point where it can completely replace workers, customers and industry experts are aware that robot service will have a major effect on the tourist and hotel industries (Xu et al., 2020). The study of consumers' attitudes about service robots and interactions between humans and robots in the service industry has also thrived (Ivanov & Webster, 2019). Three sorts of variables impact are customers' service evaluations, attitudes, and behaviors during human-robot interactions. The characteristics of service robots, such as the anthropomorphic design, usability, functionality, and level of service (Melian-Gonzalez et al., 2019) are an important factor that determines a customer's decision to use services. Similarly, age, gender, desire for human connection, technology preparedness, and other characteristics of the guests are the factors that affect the effectiveness of adopting service robots (Lee et al., 2021; Hu et al., 2021).

Because service robot implementation is still in its early phases, many of the aforementioned studies above are based on predicted or simulated service contact engagements (Yoganathan et al., 2021). Given hotels' increased interest in deploying service robots, the subject of how to evaluate robot-provided services must be addressed. In the human services business, service quality is a popular technique of recording visitor impressions and experiences of hotel services. According to study, the idea of service quality has several aspects to it and the key factors of service quality perceptions are customer expectations and subjective evaluation (Kenyon & Sen, 2015).

2.4 The acceptance of robot service

The emergence and spread of artificial intelligence (AI) and related technology are not only changing how customers engage with service providers, but

they are also generating a lot of research interest in the deployment of robot service, particularly in the hospitality sector. Researchers have looked empirically into how hotel guests perceive the use of robots because academics have recognized the importance of innovation such as robots in the delivery of services (Choi et al., 2020).

A service robot is a physical creature incorporated with information technology that can autonomously deliver personalized services. As the employment of bots is considered to be one of the most significant service marketing developments, user acceptability remains a significant obstacle to their usage in service settings (Li and Wang, 2022).

According to Niemelä et al. (2017), studies using robots in the mall by conducting two initial questionnaires to track mall customer attitudes and long-term (three years) adoption of a mall social service robot. The first study focused on the idea of a shopping mall social services robot, while the main focus of the second study is directed at the robotic platform itself. In particular, from the findings of the "With robot" research, socially engaged robot services are widely used in shopping malls.

According to Fuentes-Moraleda et al. (2020), research for the human-robot interaction (HRI) in the hotel industry was collected from 7,994 online surveys from TripAdvisor reviews from 74 hotels. Therefore, using the Service Robot Acceptance Model (sRAM) and its dimensions, conduct an analysis (functional, social-emotional, and relational). The results from this study show that the tourists have different dimensions and variables related to HRI and how they feel about the robot. However, most of them are concerned about the function of the robot which determines the experience between hotel guests and the robot.

The study from Kim et al. (2021), is about how the hotel perceives the necessity of robot service as opposed to human service after COVID-19 crisis. The results from this study show that guests have different perceptions before and after the COVID-19 because they are more concerned about their safety. Accordingly, the current COVID-19 crisis may accelerate people's adoption of robot services that provide contactless services, which can significantly minimize concerns about virus transmission through human touch.

When confronted with a situation, people react differently depending on how seriously they perceive or evaluate threats and hazards. Similarly, the researchers

also show that customers' preference for a hotel with robot personnel is significantly influenced by the threat level that they perceive. Since physical service is stated as containing emotion, guarantees, and communicability, it is possible that the demand for human service over robotic devices may return after the pandemic. Nevertheless, the utilization of advanced technology is a commercial trend. Consequently, consumer reactions to the utilization of these technologies are constantly studied in both anticipated risk scenarios and risk-free circumstances (Kim et al., 2020; Reisinger and Mavondo, 2005).

CHAPTER III
RESEARCH METHODOLOGY

3.1 Research Methodology

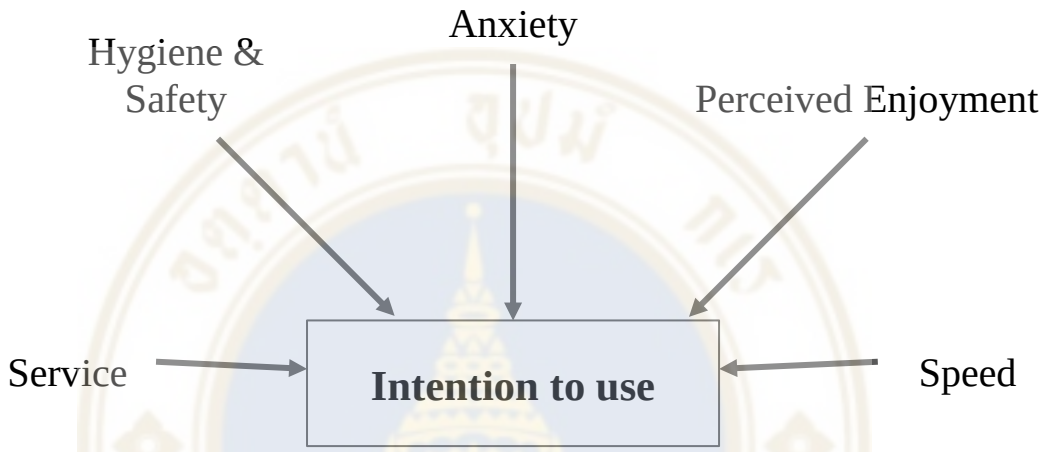


Figure 3.1: Factors that influence the ITU robot service provided in hotels

The research process begins with exploring areas of concern in order to measure intangible and abstract concepts. There are 5 constructs which are Service, Hygiene & Safety, Anxiety, Perceived Enjoyment, and Speed. As these constructs are crucial for determining the acceptance of robot service, the questionnaire was developed according to these 5 constructs in order to effectively determine the sample's viewpoint and their decision to use the service. Moreover, as seen in figure 3.1, some components will affect the questionnaire participants' intention to use.

3.2 Data collection method

This research is conducted by using quantitative analysis through an online questionnaire survey. The data is collected by spreading the questionnaire from Google form for those who have visited a hotel with a service robot or those who are interested in using a robot service in a hotel. One type of research tool is a questionnaire that

includes a set of questions designed to generate replies from samples. The questionnaire was collected from 27 June 2022 to 9 July 2022 with 179 respondents. However, this research only uses data from 156 respondents as they have been experienced with robot service in hotels or are interested in using robot service in hotels.

The survey will be divided into six sections which are introduction, screening questions, general questions, specific questions, intention to use, and demographic questions. The next explanation explains the goal and what the research wants to accomplish.

3.2.1 Survey questions

In order to understand survey respondents' acceptance and potential to use service robots in hotels, data gathering techniques will be employed in this study. Prior to the screening question, there will be an introduction to let the respondents know what they can expect in the questionnaire and the purpose of collecting it. Moreover, there will also be a time limit to complete the survey and the participants know how long it will take to do this survey as stated in the introduction part.

3.2.1.1 Screening question, the screening questions are intended to reject samples that will have no bearing on the outcome. Those who answered "no" to the screening question will therefore be eliminated from future study and analysis. In this particular case, this paper wants to understand the acceptance of robot service in hotels. Those who do not have experience and are not interested in a robot service provided in a hotel will be not significant in this survey.

3.2.1.2 General questions, in order to get accurate data for the study, general questions are asked. They are questioned about the participants' interests and conduct. These questions seldom aid in meaningful identification. Obtaining confusing information, on the other hand, may be valuable for further analysis. In this scenario, there are three questions in all.

3.2.1.3 Specific questions, these questions are utilized to collect intangible data that will be statistically examined to offer tangible outcomes. There are several sorts of reasons for using the service. Each component will represent a separate area of research. In this research, there are five constructs which are Service, Hygiene & Safety, Anxiety, Perceived Enjoyment, and Speed. These constructions have been

determined to be related to the acceptance and potential of robot service in hotels. In addition, each construct is extracted with 5-7 questions on its significance. There are 29 specific questions in this survey. These questions are then mixed up before being distributed to survey respondents to guarantee that the answers are not biased.

3.2.1.4 Intention to use question, this question is to know the intention from the respondent that they have the intention to stay at a hotel that offers robot service or not. The respondents have to choose from 1 to 4 to indicate “Strongly Disagree”, “Disagree”, “Agree”, and “Strongly Agree” respectively.

3.2.1.5 Demographic questions, which are in the last section of the questionnaire survey, are composed of five questions. All the questions were designed to determine the demographic of the respondents. The question will be about the gender, age, monthly personal income, sort of guest, and occupancy.

3.3 Analysis methods

After all the respondents have answered the survey. The data gathered from the respondents is analyzed using SPSS software. The software compares and analyzes the outcomes of a wide range of constructs used in questionnaire surveys. In this research, there will be frequency analysis, factor analysis, cross tabulation, and multiple regression.

3.3.1 Frequency analysis

Frequency analysis is the frequency each respondent has answered by using the descriptive statistics method. To help users comprehend the data and draw conclusions, SPSS Statistics can compute the mean, median, and mode when conducting frequency analysis.

3.3.2 Factor analysis

A way of minimizing a large set of variables is factor analysis into fewer components. This method is used to calculate the largest common variance among all the variables. As a total factor index, this score can be utilized for further analysis. A subset of the general linear model (GLM), factor analysis also operates on some

presumptions. There is an actual correlation between variables and factors. The study includes relevant variables, a linear connection, and there is no multicollinearity (Statisticssolutions, 2021). This research focuses on three key results which are the total variance explained, scree plot, and the rotated component matrix. The components that reflect the target groups' desire to use must then be analyzed by researchers in order to explain their findings.

3.3.3 Cross tabulations analysis

In SPSS, cross tabulations are used to capture the relationships between several elements of categorical data. To display the percentage of instances in subgroups, utilize cross tabulations. The basic cross tabulations tool in SPSS provides counts and a frequency distribution table right away. It must provide row-percentages or column-percentages for cross tabulations to make sense and create the type of information that is frequently seen in a contingency table.

3.3.4 Multiple regression analysis

Multiple regression is a statistical technique for examining the connection between an independent variable and a dependent variable. This regression is analyzed to know independent factors from forecasting the value of dependent variables. Each predictor value is weighted to show how much of a contribution has been made to the overall projection (Scientdirect, n.d.).

CHAPTER IV
RESEARCH FINDINGS

This research was designed to use a quantitative method by using google form survey. As a result, there are 179 samples to identify the acceptance of using robot service in hotels. However, there are only 156 respondents that can be used in this research from the screening questions as they have experienced or are interested in using a robot service in a hotel. This finding will help to identify the behavior of the sample. After collecting all the data, the factors that influence the customers' intention to use a service robot in the hotel industry will be examined.

4.1 Respondent profile

In general questions, there are three areas to collect which are frequency of a visit, spending on the room per night, and the length of stay.

4.1.1 The frequency of visiting in a hotel

Table 4.1.1: Frequency of how often guest visit a hotel

How often do you visit a hotel?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Once a month	25	16.0	16.0	16.0
	Twice a month	9	5.8	5.8	21.8
	Every Weekend	3	1.9	1.9	23.7
	Only on a public holiday	119	76.3	76.3	100.0
	Total	156	100.0	100.0	

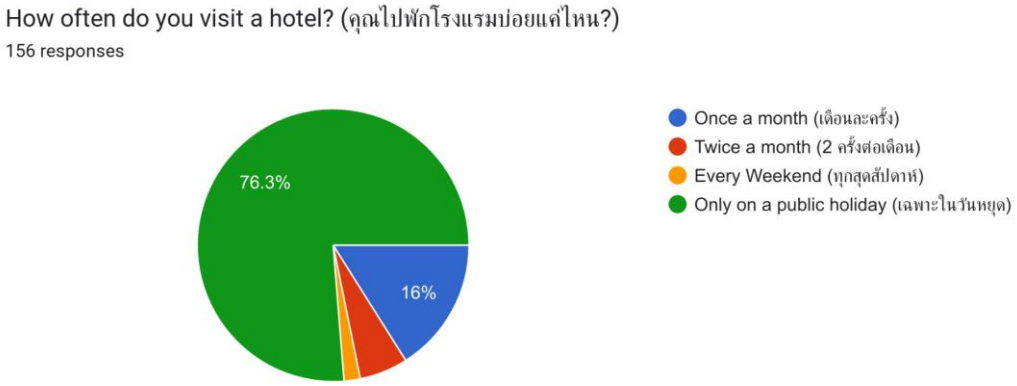


Figure 4.1.1: Pie chart of how often guest visit a hotel

There are various selections of once a month, twice a month, every weekend, and only on a public holiday. From the data collection, most of the population only visit the hotel on a public holiday with the number of 76.3%, following by 16% for once a month. Twice a month for 5.8% and 1.9% of the sample are visiting the hotel every weekend. Therefore, most of the sample visit a hotel only on a public holiday.

4.1.2 Spending on the room per night

Table 4.1.2: Frequency of spending room price per night

How much do you spend on the room price per night?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Below 1,000 Baht	5	3.2	3.2	3.2
	1,001 to 5,000 Baht	116	74.4	74.4	77.6
	5,001 to 10,000 Baht	32	20.5	20.5	98.1
	Above 10,000 Baht	3	1.9	1.9	100.0
	Total	156	100.0	100.0	

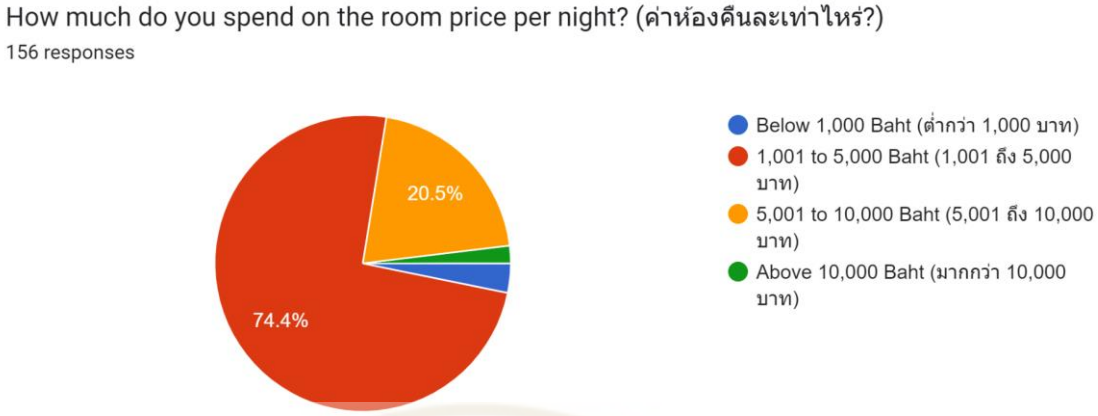


Figure 4.1.2: Pie chart of spending room price per night

There are 4 ranges which are below 1,000 Baht, 1,001 to 5,000 Baht, 5,001 to 10,000 Baht, and above 10,000 Baht. The majority of the sample spent 1,001 to 5,000 Baht on the room per night the most with 74.4%. Following by 5,001 to 10,000 Baht with 20.5%, below 1,000 Baht at 3.2%, and above 10,000 Baht 1.9%.

4.1.3 The length of stay each visit

Table 4.1.3: Frequency of night spend each visit

How many nights do you stay at a hotel each visit?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 night	43	27.6	27.6	27.6
	2 nights	101	64.7	64.7	92.3
	3 nights	9	5.8	5.8	98.1
	More than 3 nights	3	1.9	1.9	100.0
	Total	156	100.0	100.0	

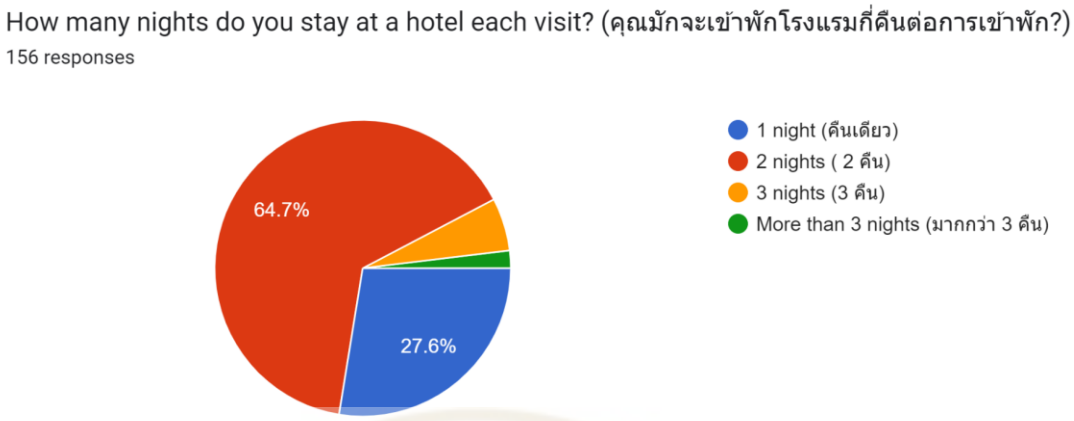


Figure 4.1.3: Pie chart of night spend each visit

There are 4 choices which are 1 night, 2 nights, and 3 nights and more than 3 nights for the length of stay at the hotel each visit. The collection turned out to be 2 nights the most with the percentage of 64.7. Following by 27.6% for 1 night. 5.8% for 3 nights and 1.9% for more than 3 nights stay in each visit the hotel.

In demographic questions from the questionnaire survey, there are 5 questions asked for the respondents which are gender, age, monthly personal income, sort of guest, and occupancy.

4.1.4 Gender

Table 4.1.4: Frequency of gender

What is your gender?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	50	32.1	32.1	32.1
	Female	101	64.7	64.7	96.8
	LGBTQ	5	3.2	3.2	100.0
	Total	156	100.0	100.0	

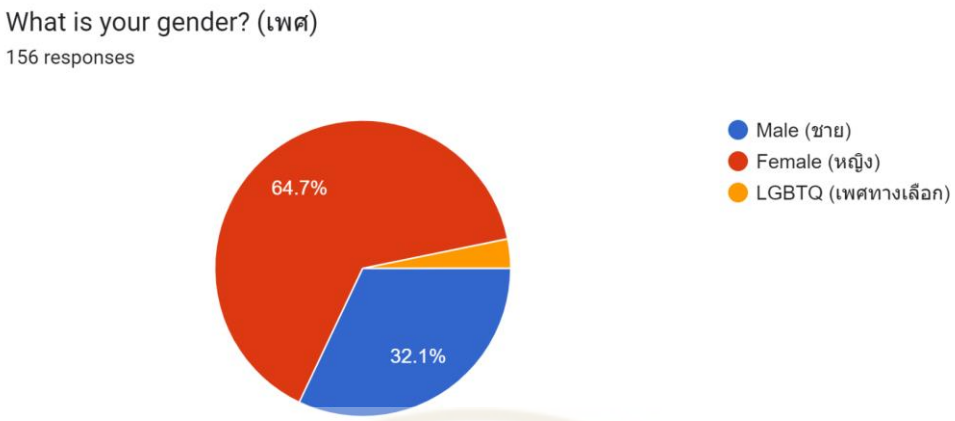


Figure 4.1.4: Pie chart of gender

From the analysis, the majority of the respondents in this research is female with the number of 64.7%. Following by 32.1% is Male and 3.2% is LGBTQ. This means that most of the samples are female with 101 out of 156 respondents.

4.1.5 Age

Table 4.1.5: Frequency of age

Could you please tell me how old are you?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	20 - 25 years old	9	5.8	5.8	5.8
	26 - 30 years old	97	62.2	62.2	67.9
	31 - 40 years old	34	21.8	21.8	89.7
	More than 40 years old	16	10.3	10.3	100.0
	Total	156	100.0	100.0	

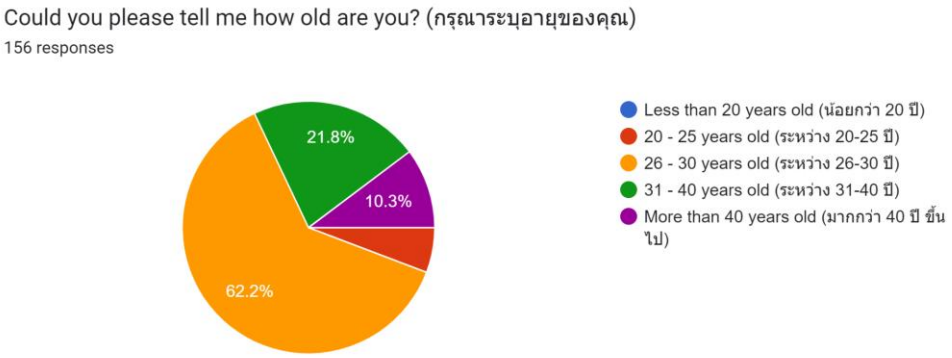


Figure 4.1.5: Pie chart of age

There are 5 ranges of age in the survey which are less than 20 years old, 20 - 25 years old, 26 - 30 years old, 31 - 40 years old, and more than 40 years old. Most of the respondents in this survey are 26 - 30 years old with the number of 62.2%. The respondents who are 31 - 40 years old are 21.8%. Then, 10.3% for those who are more than 40 years old and 5.8% age between 20 - 25 years old. None of the respondents age less than 20 years old.

4.1.6 Income

Table 4.1.6: Frequency of monthly personal income

Please provide your monthly personal income?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	20,000 Baht or less	11	7.1	7.1	7.1
	20,001 - 40,000 Baht	41	26.3	26.3	33.3
	40,001 - 60,000 Baht	37	23.7	23.7	57.1
	60,001 - 80,000 Baht	22	14.1	14.1	71.2
	More than 80,000 Baht	45	28.8	28.8	100.0
	Total	156	100.0	100.0	

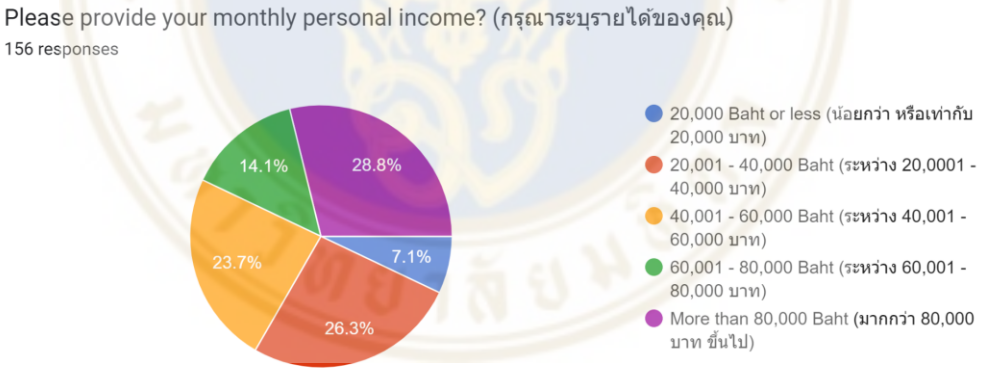


Figure 4.1.6: Pie chart of monthly personal income

20,000 Baht or less, 20,001 - 40,000 Baht, 40,001 - 60,000 Baht, 60,001 - 80,000 Baht, and more than 80,000 Baht are 5 choices for the respondents to choose for monthly personal income. More than 80,000 Baht personal monthly income is the top one with the percentage of 28.8. 26.3% of the respondent's monthly income 20,001 - 40,000 Baht. 23.7% of the respondent's monthly income 40,001 - 60,000 Baht. 14.1%

of the respondent's monthly income 60,001 - 80,000 Baht and 7.1% of the respondent's monthly income 20,000 Baht or less.

4.1.7 The type of guest

Table 4.1.7: Frequency of sort of guest

Which type of guest are you most when visiting a hotel?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Solo Traveler	8	5.1	5.1	5.1
	Couple Traveler	78	50.0	50.0	55.1
	Family Traveler	53	34.0	34.0	89.1
	Group Traveler	14	9.0	9.0	98.1
	Business Traveler	3	1.9	1.9	100.0
	Total	156	100.0	100.0	

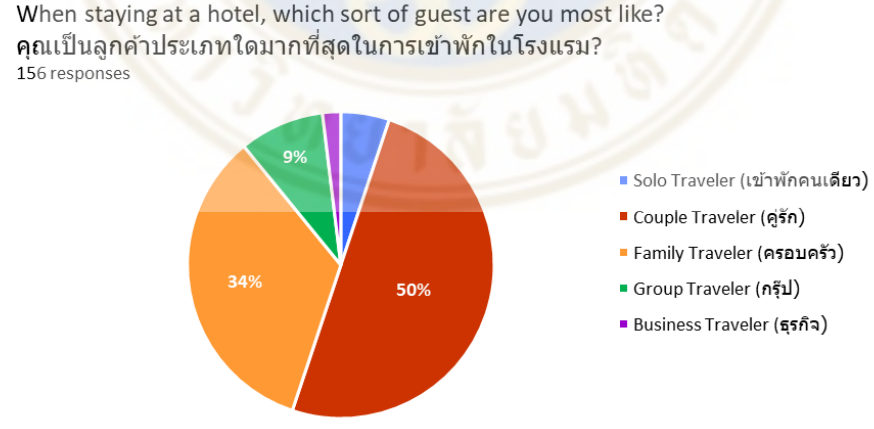


Figure 4.1.7: Pie chart of sort of guest

There are various choices for types of guests in the questionnaire. There are Solo Traveler, Couples Traveler, Family Traveler, Group Traveler, and Business Traveler. The majority type of guest is a Couple Traveler with a percentage of 50.

Family Traveler 34%, Group Traveler 9%, Solo Traveler 5.1%, and Business Traveler 1.9%.

4.1.8 Occupancy

Table 4.1.8: Frequency of occupation

Please indicate your occupation?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Student	7	4.5	4.5	4.5
	Office worker	82	52.6	52.6	57.1
	Self-employed	39	25.0	25.0	82.1
	Homemaker	1	.6	.6	82.7
	Others	27	17.3	17.3	100.0
	Total	156	100.0	100.0	

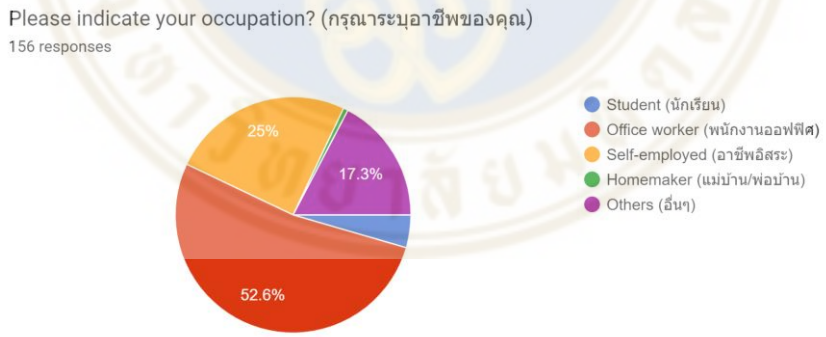


Figure 4.1.8: Pie chart of occupation

Student, office worker, self-employed, homemaker, and others are 5 occupancy choices for the respondents. The results show that the respondents are an office worker the most with the number of 52.6%. Where self-employed is 25%, others 17.3%, students 4.5%, and homemakers 0.6% or only 1 person of the samples is a homemaker.

4.2 Factor Analysis

4.2.1 Total Variance Explained

Table 4.2.1: Total Variance Explained (After)

Total Variance Explained

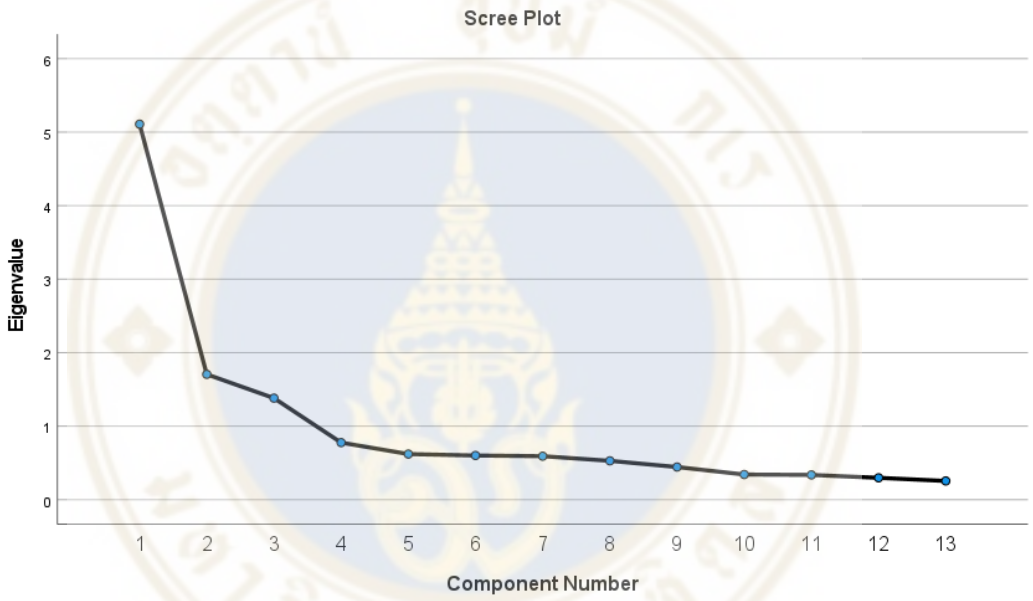
Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.109	39.303	39.303	2.977	22.898	22.898
2	1.706	13.124	52.426	2.649	20.377	43.275
3	1.382	10.633	63.060	2.572	19.785	63.060
4	.777	5.979	69.039			
5	.621	4.780	73.818			
6	.602	4.630	78.449			
7	.593	4.558	83.007			
8	.529	4.073	87.080			
9	.445	3.424	90.504			
10	.343	2.640	93.143			
11	.338	2.597	95.740			
12	.298	2.294	98.034			
13	.256	1.966	100.000			

Extraction Method: Principal Component Analysis.

According to table 4.2.1, it has changed after cutting one by one factor that has a cross loading, low factor loading, and mismatch meaning. The finalized ended up with 13 questions for 3 constructions. In addition, the components in the eigenvalues aggregate to explain is 63 percent of the variation.

4.2.2 Scree Plot

Table 4.2.2: Scree Plot (After)



The scree plot has a better visual to see how many significant factors that we have left from the first run. The graph becomes more horizontal after 4 components which do not want to count. Additionally, the result from component 4 onward has the eigenvalues lower than 1 as well in the total variance explained.

4.2.3 Rotated Component Matrix

Table 4.2.3: Rotated component Matrix (After)

Rotated Component Matrix[a]

	Component		
	1	2	3
I would rather communicate with a robot than a human when I need service.	.793		
I would rather have a robot serve me than a human.	.750		
The hotel's robot service delivered the best service.	.706		
Among the other services, I would rank the robot service #1.	.690		
I would rather communicate with a service robot.	.643		
I feel protected against virus transmission when a robot is performing the service.		.860	
For my virus protection, I prefer to use a robot for services.		.809	
Robots are more hygienic and safer than people.		.717	
I favor a contactless room service delivery.		.629	
Robot service will be faster than human service.			.837
Robot service is fast.			.788
I can save more time with a robot service.			.767
If I use the robot service, I will quickly receive my request.			.655

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a

a. Rotation converged in 5 iterations.

From table 4.2.3, it can demonstrate a nice and clear table with 3 components left. The construct name will be Interactive Experience, Hygiene & Safety, and Speed.

4.2.3.1 the 1st construct: Interactive Experience

I would rather communicate with a robot than a human when I need service.

I would rather have a robot serve me than a human.

The hotel's robot service delivered the best service.

Among the other services, I would rank the robot service #1.

I would rather communicate with a service robot.

4.2.3.2 the 2nd construct: Hygiene & Safety

I feel protected against virus transmission when a robot is performing the service.

For my virus protection, I prefer to use a robot for services.

Robots are more hygienic and safer than people.

I favor a contactless room service delivery.

4.3.2.3 the 3rd Construct: Speed

Robot service will be faster than human service.

Robot service is fast.

I can save more time with a robot service.

If I use the robot service, I will quickly receive my request.

4.2.4 Descriptive Statistics

Table 4.2.4: Descriptive Statistics

Descriptive Statistics

	Mean	Std. Deviation	Analysis N
I would rather have a robot serve me than a human.	2.56	.874	156
The hotel's robot service delivered the best service.	2.52	.947	156
Robots are more hygienic and safer than people.	3.14	.876	156
Robots are fascinating to me.	2.81	.989	156
Robot service will be faster than human service.	2.64	.908	156
Robot service is fast.	2.76	.804	156
If I use the robot service, I will quickly receive my request.	2.86	.823	156
I would rather communicate with a service robot.	3.10	.914	156
I would rather communicate with a robot than a human when I need service.	2.44	.978	156
I feel protected against virus transmission when a robot is performing the service.	3.24	.822	156
I favor a contactless room service delivery.	3.47	.731	156
I can save more time with a robot service.	3.09	.830	156
I believe robot service will make fewer mistakes than people.	2.90	.851	156
For my virus protection, I prefer to use a robot for services.	3.23	.761	156
Among the other services, I would rank the robot service #1.	2.53	.897	156

In descriptive statistics, there are three components which are Mean, Standard Deviation, and Analysis N. Mean shows the average finding from the respondents. Standard Deviation shows how closely together each factor's answers are.

In this case, Analysis N is equal to 156 from 179 respondents. For significant factors, 1 indicates “Strongly Disagree”, 2 for “Disagree”, 3 for “Agree”, and 4 for “Strongly Agree” accordingly. Consequently, we may essentially state that the component that demonstrates the respondents are likely to respond “Agree” when the mean indicates a figure higher than 2.5. In contrast, the mean that displays a figure lower than 2.5 indicates that the answer is “Disagree”. From the research, there is only one question that the respondents “Disagree” with which is “I would rather communicate with a robot than a human when I need service”. This means that the respondents still prefer to communicate with a human when they need service.

4.3 Cross tabulation

4.3.1 Crosstabs Interactive Experience* Income

Table 4.3.1: Interactive Experience * Monthly personal income

I would rather communicate with a service robot. * Please provide your monthly personal income? Crosstabulation

Count

		Please provide your monthly personal income?					
		20,000 Baht or less	20,001 - 40,000 Baht	40,001 - 60,000 Baht	60,001 - 80,000 Baht	More than 80,000 Baht	Total
I would rather communicate with a service robot.	Strongly Disagree	1	1	5	2	1	10
	Disagree	0	8	8	4	8	28
	Agree	6	17	13	5	14	55
	Strongly Agree	4	15	11	11	22	63
Total		11	41	37	22	45	156

For all tiers of monthly personal income, the majority of respondents “Strongly Agree” with the statement "I would rather communicate with a service robot," according to the attribute of Interactive Experience. With the number of 63 of all 156 respondents “Strongly Agree”. While 55 people of all the respondents “Agree”. Therefore, respondents would rather communicate with a service robot for their Interactive Experience.

4.3.2 Crosstabs Hygiene & Safety * Age

Table 4.3.2: Hygiene & Safety * Age

I feel protected against virus transmission when a robot is performing the service. * Could you please tell me how old are you? Crosstabulation

Count

		Could you please tell me how old are you?				
		20 - 25 years old	26 - 30 years old	31 - 40 years old	More than 40 years old	Total
I feel protected against virus transmission when a robot is performing the service.	Strongly Disagree	0	3	0	1	4
	Disagree	1	18	3	4	26
	Agree	2	27	16	9	54
	Strongly Agree	6	49	15	2	72
Total		9	97	34	16	156

From the attribute of Hygiene & Safety, the question of "I feel protected against virus transmission when a robot is performing the service", the majority of the respondents "Strongly Agree". There are 6 people out of 9 from 20-25 years old who "Strongly Agree" and 49 out of 97 of age 26-30 years old who "Strongly Agree". While aged 31-40 years old 16 out of 34 of them "Agree" and 15 of them strongly "Agree". There are 16 respondents who are more than 40 years old 16 people, 9 of them "Agree" and 2 of them "Strongly Agree". This can conclude that the majority of all ages "Strongly Agree" to feel protected against virus transmission when a robot is performing the service.

4.3.3 Crosstabs Speed * Income

Table 4.3.3: Speed * Monthly personal income

Robot service is fast. * Please provide your monthly personal income? Crosstabulation

Count

		Please provide your monthly personal income?					
		20,000 Baht or less	20,001 - 40,000 Baht	40,001 - 60,000 Baht	60,001 - 80,000 Baht	More than 80,000 Baht	Total
Robot service is fast.	Strongly Disagree	1	2	2	1	2	8
	Disagree	3	12	14	8	12	49
	Agree	5	19	15	9	23	71
	Strongly Agree	2	8	6	4	8	28
Total		11	41	37	22	45	156

From the factor of Speed, the attribute “robot service is fast”. The majority of all the range of monthly personal income “Agree” that the robot service is fast with the number of 71 of the total 156 respondents. Here it shows that the respondent thinks the robot service is fast.

4.4 Multiple regression

From the analysis, the “intention to use” is to indicate from 1 to 4 from “Strongly Disagree”, “Disagree”, “Agree”, and “Strongly Agree” consequently. This analysis analyzes that the majority of the respondents “Agree” to accept the use of robot service in hotels as the mean of intention to use which is 3.12 that is more than 2.5. The standard deviation of .827 is telling about the response of most clusters. Where it can be summarized that the respondents are interested in accepting the robot service use in hotels. Besides, this implied the Interactive Experience, Hygiene & Safety, and Speed have indicated clearer numbers to summarize the analyzing. All their Mean and Standard Deviations are strong to indicate “Agree” for all 3 factors.

4.4.1 Descriptive statistics

Table 4.4.1: Descriptive Statistics for three factors and intention to use

Descriptive Statistics

	Mean	Std. Deviation	N
I intent to select a hotel with robot service	3.12	.827	156
Interactive Experience	2.7615	.71305	156
Hygiene & Safety	3.2724	.64155	156
Speed	2.8381	.66890	156

After the final run for factor analysis, all the data are clear and make sense. There are three factors named Interactive Experience, Hygiene & Safety, and Speed. To assess and examine the connection between the independent and dependent variables, multiple regression uses these three factors. In this case, the dependent variable indicates the intention to use where the question is “I intent to select a hotel with robot service”. For the independent variables are the 3 factors which are Interactive Experience, Hygiene & Safety, and Speed.

To examine statistical findings, 4 key factors are used.

1. **I intent to select a hotel with robot service (ITU)**: the mean in this factor is 3.12 which represents “Agree”. It has a high cluster at Standard Deviation of .827.
2. **Interactive Experience**: the mean indicates “Agree” where the factor with a number of 2.76. Samples have a high cluster at Standard Deviation of .713.
3. **Hygiene & Safety**: the mean in the factor with a number of 3.27 which is “Agree”. The responses have a high cluster at the standard deviation of .642
4. **Speed**: the mean in the factor of 2.84 shows “Agree”. The responses have a high cluster at the standard deviation of .669 for this factor.

4.4.2 Anova

Table 4.4.2: Anova

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	52.007	3	17.336	48.874	<.001[b]
	Residual	53.916	152	.355		
	Total	105.923	155			

a. Dependent Variable: I intent to select a hotel with robot service

b. Predictors: (Constant), Speed, HygieneSafety, Interactive Experience

For the Anova analysis figure, use to see the difference between each factor, F of 48.874 is significant and indicates three constructs which are Interactive Experience, Hygiene and Safety, and Speed are different as it is higher than 1. The Significant value of <.001[b] is less than 0.05 value chosen from the test this indicates the significance of the regression. To conclude, all three factors are related to the "intention to use" of robot service in the hotels.

4.4.3 Coefficients analysis

Table 4.4.3: Coefficients

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.362	.278		1.302	.195
	Interactive Experience	.625	.083	.539	7.496	<.001
	Hygiene & Safety	.330	.089	.256	3.715	<.001
	Speed	-.019	.081	-.015	-.231	.817

a. Dependent Variable: I intent to select a hotel with robot service

Standardized Coefficients Beta is where the higher is the better for each significant variable. For each increase in Interactive Experience by one unit, intention to use increases by .083. For each increase in Hygiene & Safety by one unit, intention to use increases by .089. Intention to use rises by .081 for every unit increase in Speed. Significance indicates factors with <.001 for 2 factors which are Interactive Experience and Hygiene & Safety. Significance indicates factors with .817 for Speed. Where two of the variables' factors of Interactive Experience and Hygiene are relevant to explain the significance of the intention to use to select a hotel with robot service.

4.5 The conceptual framework

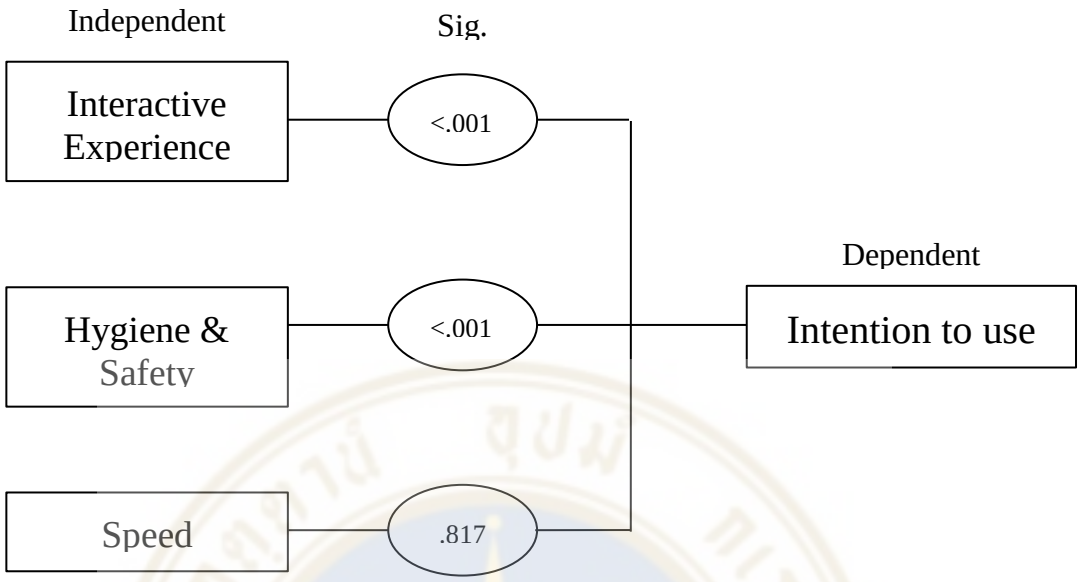


Figure 4.5: The conceptual Framework for three factors

All independent factors, excluding Speed, are relevant to the intention to use or a dependent variable for the multiple regression analysis. This is because the significant levels of Interactive Experience and Hygiene & Safety are less than 0.05. In the other word, Interactive Experience and Hygiene & Safety may be utilized to explain that the respondents see these both factors having an important impact on the acceptance of robot service in hotels.

CHAPTER V
CONCLUSION

5.1 Conclusions

This research was conducted to examine the effects of Covid-19 in the hotel industry and to study the acceptance of using a robot to deliver service to customers in the hospitality industry. The effect of the Covid-19 has significantly decreased the number of visitors in hotels as people have become more concerned about their health safety. As a result, hotels can exploit this crisis by adopting service robots to serve their customers. This is due to the fact that the service robot is an innovative technology that can help to minimize and limit guest-staff interactions. Guests can have a contactless service while staying at the hotel that provides a service robot to deliver service for them. Likewise, to indicate the relationship between intention to use and the factors that will benefit to the acceptance and potential of using robotics to provide a service to hotel's guests.

According to the result of the data analysis, there are 156 samples with 101 female, 50 male, and 5 LGBTQ. 62.2% of the participants are between 26 - 30 years old. The findings also indicate that office workers make up the majority of respondents (52.6%). From the factor analysis, there are three constructs which are Interactive Experience, Hygiene & Safety, and Speed. Interactive Experience and Hygiene & Safety are the factors that customers are concerned about when it comes to their acceptance and potential to use service robots in hotels. The first factor that has the strongest influence on the acceptance of service robots in hotels is Interactive Experience. The study by Mele et al. (2022) also examines the positive relationship between the smart technology in the service area and the smart service experience. The second factor is the Hygiene & Safety that hotel guests are concerned with regarding the use of service robots in hotels. In contrast, Speed has no influence on a guest's decision to choose the hotel that provides a robot service. The research from Marques et al. (2022) those also study about the relation between hotel robot and hygiene, the

results show that robotics, artificial intelligence, and human-robot interactions have become more prevalent in order to control the spread of COVID-19, and these new preferred technologies are paving the way to the new normal in the post-COVID-19 pandemic era by creating a safe and secure hotel environment for the guests and employees.

5.2 Recommendations

Considering multiple regression analysis, the two factors that are significant in determining a customer's decision to use service robots in hotels are Interactive Experience and Hygiene & Safety. The perceptual map will be used to compare the least and most Hygiene & Safety for Hygiene & Safety factor. Furthermore, passive experience and active experience are for the Interactive Experience factor. Nowadays, there are a variety of robots to choose from in order to maximize benefits for the service in a hotel. Currently, there are 4 robots that are available and suitable for hotel usage.

Temi 3

The personal robot or temi provides contactless check-in and check-out for guests. Moreover, Temi 3 can lead the way for guests wherever they want to go such as the gym, swimming pool, and bar. It also offers a function that will suggest places for guests to explore, such as cafes, attractions, and gyms. Temi 3 can add an extra camera for protection care service where a temperature check is automatically available for guests and there is also an auto antiseptic spray installed behind the robot. Additionally, it includes two-way communication so that customers may engage with the robot via voice (Temi, n.d.).

Keenon W-3

Keenon W-3 is a robot that has an innovative experience for the smart welcome and delivery service. Keenon W-3 can learn the location of the guest room and the elevator automatically. Furthermore, it can automatically plan the path for delivery and is capable of avoiding obstacles and people by itself. Guests can use Keenon W-3 to lead a way. The robot can perform each task and complete various services independently (Keenon, n.d.).

Savioke's Relay

Savioke's Relay can perform many functions. It is "self-driving" that eliminates the time-consuming job of delivery. Employees may save time and can then concentrate on high-value customer interactions. Relay can also do a concierge task. Relay performs room service delivery in places with the greatest level of safety and reliability. The Relay can automatically call the elevators and make the delivery finish in no more than 10 minutes. It also contains lockable compartments to keep the items safe (Relayrobotics, n.d.).

PUDU

PUDU or KettyBot is a robot that has an advertising screen display in front of the robot. KettyBot has 2-in-1 functions which are welcoming guests and delivering items. It can move back and forth to show hotel information, such as a restaurant's opening hour as well as a special promotion that is offered for a limited amount of time. Furthermore, it could lead guests to a certain location. Guests can touch PUDU for reviews with vivid expressions (PUDU, n.d.).

5.2.1 Interactive Experience features

Table 5.2.1.1: Interactive Experience features

Interactive Experience	Temi 3	Keenon W-3	Relay	KettyBot
Face recognition	✓			
Check-in & Check-out features	✓			
Two-way communications	✓			✓
Greeting & Escorting	✓	✓	✓	✓
Total points	**4**	**1**	**1**	**2**

Table 5.2.1.2: The factor rating method of Interactive Experience

Interactive Experience	Weight	Scores (out of 100)				Weighted scores			
		Temi 3	Keenon W-3	Relay	PUDU	Temi 3	Keenon W-3	Relay	PUDU
Face recognition	0.10	100	0	0	0	10	0	0	0
Check-in & Check-out features	0.20	100	0	0	0	20	0	0	0
Two-way communications	0.40	100	0	0	100	40	0	0	40
Greeting & Escorting	0.30	100	100	100	100	30	30	30	30
	1.00					**100**	**30**	**30**	**70**

As the Interactive Experience factors are one of the factors that guests are concerned about using a service robot. Therefore, the features table and the factor rating method will be used to compare between 4 robots. There are face recognition, check-in & checkout features, two-way communications, and greeting & escorting will be used to compare the total point and score of each robot. From the table 5.2.1.1, the total points will be 4 as there are 4 features. Face recognition is where the robot is able to recognize

guests' faces. Check-in & check-out features are where guests can directly go through the whole check-in and check-out process through the robot. Two-way communications features are when the robot can interact and answer a guest's questions via voice functions. Lastly, greeting & escorting is where the robot is available to welcome guests and escort them to rooms or places that customers wish to go. Temi 3 has the highest point as it has all 4 features compared to other robots. In table 5.2.1.2, the weight from the importance of the factor that customers want to interact with the robot by having two-way communication is the highest weight. Following by Greeting & Escorting with weight 0.3 where guests can perceive experience. Check-in & Check-out features are weighted at 0.2 where it is less important when compared to Two-way communication and Greeting & Escorting. The last one is face recognition where it is the least important for the interactive experience between guest and robot. Temi 3 has the highest weighted scores of 100.

5.2.2 Hygiene & Safety features

Table 5.2.2.1 Hygiene & Safety features

Hygiene & Safety	Temi 3	Keenon W-3	Relay	KettyBot
Navigation & Maneuvering	✓	✓	✓	✓
Contactless service	✓	✓	✓	✓
Autonomous elevator operation		✓	✓	
Lockable payload		✓	✓	
Total points	**2**	**4**	**4**	**2**

Table 5.2.2.2: The factor rating method of Hygiene & Safety

Hygiene & Safety	Weight	Scores (out of 100)				Weighted scores			
		Temi 3	Keenon W-3	Relay	PUDU	Temi 3	Keenon W-3	Relay	PUDU
Navigation & Maneuvering	0.20	100	100	100	100	20	20	20	20
Contactless service	0.30	100	100	100	100	30	30	30	30
Autonomous elevator operation	0.20	0	100	100	0	0	20	20	0
Lockable payload	0.30	0	100	100	0	0	30	30	0
	1.00					**50**	**100**	**100**	**50**

Navigation & maneuvering, contactless service, autonomous elevator operation, and lockable payload are taken into account under Hygiene & Safety factor. Navigation & maneuvering is where the robot can walk without needing any assistance from humans and can avoid hitting the obstacle or bump into people. Contactless service is where the robot can help customers keep safe distance and reduce person-to-person contact in order to mitigate the COVID-19 transmission. Additionally, autonomous elevator operation can effectively reduce virus transmission as there is no need for staff to physically press the elevator button and risk transmitting virus through touching contaminated surfaces. Finally, lockable payload is when the robot can secure the items stored inside its body for a safe delivery process to the customer. Contactless service and lockable payload will be given more weight in table 5.2.2.2 than navigation & maneuvering and autonomous elevator operation. This is due to the fact that it can prevent virus transmission. The lockable payload can avoid human touch points and also keep the stuff safe during the route to the destination.

Keenon W-3 and Relay have the highest points according to the table 5.2.2.1. It means that these two robots provide all the 4 features. In the factor rating method of Hygiene & Safety, the score of Keenon W-3 and Relay are 100. Whereas Temi 3 and PUDU weight scores are 50.

5.2.3 Perceptual Map

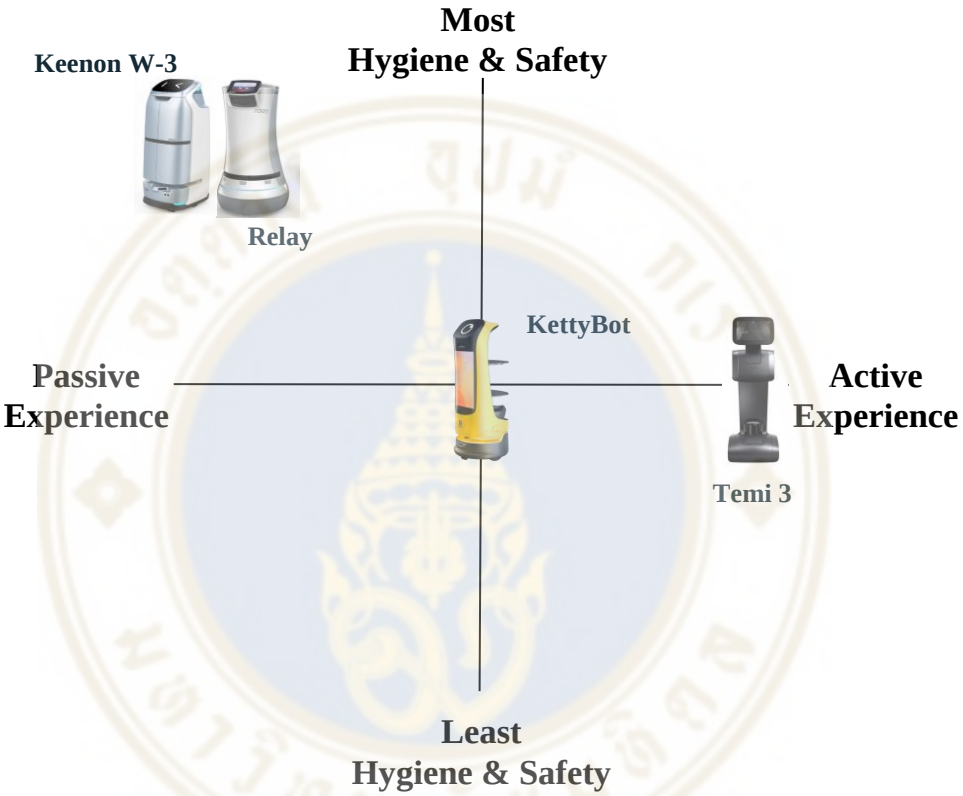


Figure 5.2.3: Perceptual Map

From the perceptual map, Hygiene & Safety is one of the important factors as it is deemed as crucial in a guest's perspective and decision to visit a hotel that offers a robot service. Temi 3 has the best active experience in Interactive Experience factor. Since this factor is the most important in influencing a customer's decision to use a service robot in a hotel. Consequently, utilizing Temi 3 is an excellent alternative for a hotel to help provide a better experience for the customers and reduce physical touchpoints to mitigate the possible spread of the COVID-19.

5.3 Limitations of the study

In this paper, there are some limitations of this research as the respondent's number remains limited, with the number of only 179 respondents to help identify the acceptance of using robot service in hotels. Besides, only information from 156 respondents can be used in the study because this group has experience with and is interested in using the hotel robot service.

Because of the time constraint, the sample size is small. Collecting more samples is highly recommended for a better examination for the acceptance and potential of robot service provided in a hotel. Another limitation is due to the lack of data distribution in gender. 101 out of 156 of the respondents are female which is a huge number when compared with others. A greater gender balance is encouraged in the future study in order to obtain a wider range of perspectives from different genders equally. This will provide better outcomes when demonstrating a hotel's adoption of service robots. Subsequently, this research was conducted in Thailand so, the respondents are all Thai people who live in Thailand. For this reason, this research might not be applicable to a hotel whose customers are mostly international tourists. Since the customers' decision to use the robot service may vary as it can be influenced by different cultures as well as various requirements and desires. This research will become more applicable to hotels that target international travelers if the group of survey respondents is expanded to include foreigners.

5.4 Further research

Because this study was limited to Thai nationals, future research should include people from various nationalities. With different social norms, personal experiences, and cultures, the findings could turn out totally different from diverse responses. Moreover, to get a greater idea of how the hotel plans to employ the service robot. There are several varieties of service robots, so learning more about how they differ may assist in choosing the most suitable service robots to help fulfill customers' needs and desires. Furthermore, more research into detailed information to compare the usability of each service robot can be beneficial for hotels ranging from economy to

luxury. Therefore, further research could potentially benefit management teams in order to rationalize their selection and their marketing for the hotel.

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APPENDICES

Questionnaire - Robotic service in hotel

I am a master's degree student at College of Management Mahidol University and currently exploring the acceptance of using robots in the hotel industry where there can be a contactless process in the hotel such as Concierge service, Room service, and Check-in & Check out.

The scope of this 5 minutes survey is to understand the acceptance in this robot service among the hotel visits.

Screening Questions

1. Have you ever experienced a service robot in a hotel?
   - **a. Yes (Go to General Questions)**
   - b. No (Go to question 2)

2. Are you interested in using a robot service in a hotel?
   - **c. Yes (Go to General Questions)**
   - d. No (Thank you for your time)

General questions

3. How often do you visit a hotel?
   - a. Once a month
   - b. Twice a month
   - c. Every Weekend
   - d. Only on a public holiday

4. How much do you spend on the room price per night?
   - a. Below 1,000 Baht
   - b. 1,001 to 5,000 Baht
   - c. 5,001 to 10,000 Baht
   - d. Above 10,000 Baht

5. How many nights do you stay at a hotel each visit?
   - a. 1 night
   - b. 2 nights
   - c. 3 nights
   - d. More than 3 nights

Specific question

	Please indicate to what extent you agree or disagree with the following statement	Strongly Disagree	Disagree	Agree	Strongly Agree
		1	2	3	4
1	I would rather have a robot serve me than a human.				
2	When using robot services, I'm concerned about privacy issues.				
3	When dealing with a robot, I won't be worried if I make a mistake.				
4	Using a robot's service, I won't be afraid to break it.				
5	The robot communicating to me will be fun for me.				
6	The hotel's robot service delivered the best service.				
7	Robots are more hygienic and safer than people.				
8	Robots are fascinating to me.				
9	Robot service will be faster than human service.				
10	Robot service is fast.				
11	Robot service as self-service is available 24/7				
12	Interacting with robot services is enjoyable for me.				
13	If I use the robot service, I will quickly receive my request.				
14	I'm pleased with robot service.				
15	I'm not afraid of robots.				
16	I would rather communicate with a service robot.				
17	I would rather communicate with a robot than a human when I need service.				
18	I would rather check in and out using contactless technology.				
19	I worry about issues brought on by robot services.				
20	I think robots are adorable.				
21	I prefer to have contactless room service.				
22	I feel protected against virus transmission when a robot is performing the service.				
23	I favor a contactless room service delivery.				
24	I don't find robots frightening.				
25	I can save more time with a robot service.				
26	I believe robot service will make fewer mistakes than people.				
27	I believe a robot will assist me in getting the service I need.				
28	For my virus protection, I prefer to use a robot for services.				
29	Among the other services, I would rank the robot service #1.				

Intention to use

Intention to use				
I intent to select a hotel with robot service				

Demographic questions

1. What is your gender?

   a. Male
   b. Female
   c. LGBTQ

2. Could you please tell me how old are you?
   a. Less than 20 years old
   b. 20 - 25 years old
   c. 26 - 30 years old
   d. 31 - 40 years old
   e. More than 40 years old

3. Please provide your monthly personal income?
   a. 20,000 Baht or less
   b. 20,001 - 40,000 Baht
   c. 40,001 - 60,000 Baht
   d. 60,001 - 80,000 Baht
   e. More than 80,000 Baht

4. When staying at a hotel, which sort of guest are you most like?
   a. Solo Traveler
   b. Couple Traveler
   c. Family Traveler
   d. Group Traveler
   e. Business Traveler

5. Please indicate your occupation?
   a. Student
   b. Office worker
   c. Self-employed
   d. Homemaker
   e. Others

Thank you for your time to complete the survey!

Service				
Please indicate to what extent you agree or disagree with the following statement	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**
	1	**2**	**3**	**4**
I would rather have a robot serve me than a human.				
Among the other services, I would rank the robot service #1.				
The hotel's robot service delivered the best service.				
I would rather communicate with a service robot.				
I believe robot service will make fewer mistakes than people.				

Hygiene & Safety				
Please indicate to what extent you agree or disagree with the following statement	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**
	1	**2**	**3**	**4**
Robots are more hygienic and safer than people.				
For my virus protection, I prefer to use a robot for services.				
I would rather check in and out using contactless technology.				
I prefer to have contactless room service.				
I favor a contactless room service delivery.				
I feel protected against virus transmission when a robot is performing the service.				

Anxiety				
Please indicate to what extent you agree or disagree with the following statement	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**
	1	**2**	**3**	**4**
When dealing with a robot, I won't be worried if I make a mistake.				
Using a robot's service, I won't be afraid to break it.				
I don't find robots frightening.				
I'm not afraid of robots.				
When using robot services, I'm concerned about privacy issues.				
I worry about issues brought on by robot services.				

Perceived Enjoyment				
Please indicate to what extent you agree or disagree with the following statement	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**
	1	**2**	**3**	**4**
Interacting with robot services is enjoyable for me.				
I would rather communicate with a robot than a human when I need service.				
I'm pleased with robot service.				
I believe a robot will assist me in getting the service I need.				
The robot communicating to me will be fun for me.				
I think robots are adorable.				
Robots are fascinating to me.				

Speed				
Please indicate to what extent you agree or disagree with the following statement	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**
	1	**2**	**3**	**4**
Robot service is fast.				
Robot service will be faster than human service.				
Robot service as self-service is available 24/7				
If I use the robot service, I will quickly receive my request.				
I can save more time with a robot service.				

Intention to use				
Please indicate to what extent you agree or disagree with the following statement	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**
	1	**2**	**3**	**4**
I intend to stay at a hotel that offers robot service.				

CODEBOOK

Screening Questions		Intention to use (1 Strongly Disagree, 2 Disagree, 3 Agree, 4 Strongly Agree)	
Q1	Have you ever experienced a service robot in a hotel?	Q35	I would rather have a robot serve me than a human.
1	Yes	Demographic Questions	
0	No	Q36	What is your gender?
Q2	Are you interested in using a robot service in a hotel?	1	Male
1	Yes	2	Female
0	No	3	LGBTQ
General Questions		Q37	Could you please tell me how old are you?
Q3	How often do you visit a hotel?	1	Less than 20 years old
1	Once a month	2	20 - 25 years old
2	Twice a month	3	26 - 30 years old
3	Every Weekend	4	31 - 40 years old
4	Only on a public holiday	5	More than 40 years old
Q4	How much do you spend on the room price per night?	Q38	Please provide your monthly personal income?
1	Below 1,000 Baht	1	20,000 Baht or less
2	1,001 to 5,000 Baht	2	20,001 - 40,000 Baht
3	5,001 to 10,000 Baht	3	40,001 - 60,000 Baht
4	Above 10,000 Baht	4	60,001 - 80,000 Baht
Q5	How many nights do you stay at a hotel each visit?	5	More than 80,000 Baht
1	1 night	Q39	When staying at a hotel, which sort of guest are you most like?
2	2 nights	1	Solo Traveler
3	3 nights	2	Couple Traveler
4	More than 3 nights	3	Family Traveler
		4	Group Traveler
		5	Business Traveler
Specific Questions (1 Strongly Disagree, 2 Disagree, 3 Agree, 4 Strongly Agree)		Q40	Please indicate your occupation?
Q6	I would rather have a robot serve me than a human.	1	Student
Q7	When using robot services, I'm concerned about privacy issues.	2	Office worker
Q8	When dealing with a robot, I won't be worried if I make a mistake.	3	Self-employed

CODEBOOK (cont.)

Q9	Using a robot's service, I won't be afraid to break it.	4	Homemaker
Q10	The robot communicating to me will be fun for me.	5	Others
Q11	The hotel's robot service delivered the best service.		
Q12	Robots are more hygienic and safer than people.		
Q13	Robots are fascinating to me.		
Q14	Robot service will be faster than human service.		
Q15	Robot service is fast.		
Q16	Robot service as self-service is available 24/7		
Q17	Interacting with robot services is enjoyable for me.		
Q18	If I use the robot service, I will quickly receive my request.		
Q19	I'm pleased with robot service.		
Q20	I'm not afraid of robots.		
Q21	I would rather communicate with a service robot.		
Q22	I would rather communicate with a robot than a human when I need service.		
Q23	I would rather check in and out using contactless technology.		
Q24	I worry about issues brought on by robot services.		
Q25	I think robots are adorable.		
Q26	I prefer to have contactless room service.		
Q27	I feel protected against virus transmission when a robot is performing the service.		
Q28	I favor a contactless room service delivery.		
Q29	I don't find robots frightening.		
Q30	I can save more time with a robot service.		
Q31	I believe robot service will make fewer mistakes than people.		
Q32	I believe a robot will assist me in getting the service I need.		
Q33	For my virus protection, I prefer to use a robot for services.		
Q34	Among the other services, I would rank the robot service #1.		

Factor Analysis

Total Variance Explained (Before)

Total Variance Explained

	Initial Eigenvalues			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8.751	30.177	30.177	4.684	16.152	16.152
2	2.345	8.086	38.262	3.168	10.923	27.075
3	1.736	5.986	44.248	3.074	10.601	37.676
4	1.698	5.856	50.103	3.042	10.491	48.167
5	1.337	4.611	54.714	1.402	4.833	53.000
6	1.157	3.990	58.704	1.352	4.660	57.660
7	1.009	3.479	62.183	1.311	4.522	62.183
8	.935	3.223	65.406			
9	.899	3.101	68.507			
10	.849	2.927	71.434			
11	.833	2.871	74.305			
12	.702	2.422	76.727			
13	.689	2.376	79.103			
14	.652	2.248	81.351			
15	.616	2.124	83.475			
16	.581	2.004	85.479			
17	.516	1.778	87.257			
18	.469	1.616	88.873			
19	.456	1.573	90.447			
20	.424	1.464	91.910			
21	.350	1.206	93.116			
22	.347	1.196	94.313			
23	.299	1.032	95.345			
24	.294	1.014	96.359			
25	.255	.880	97.239			

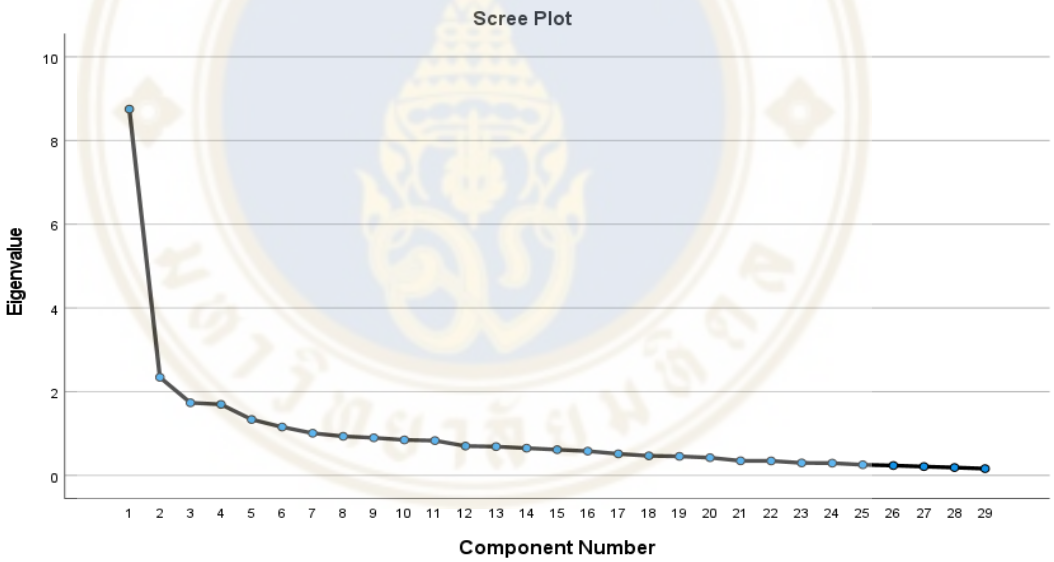
Total Variance Explained (Before) (cont.)

26	.237	.816	98.056		
27	.212	.731	98.787		
28	.189	.652	99.439		
29	.163	.561	100.000		

Extraction Method: Principal Component Analysis.

Total Variance Explained table demonstrates how many components according to the table. The initial result shows the eigenvalue over 1 are at 7 components where we got 62% variance in the total explained with 7 factors.

Scree Plot (Before)



The Scree plot demonstrates the significant factor. The initial scree plot is not clear enough to separate. Therefore, the analysis might be impossible, so the attributes need to be cut more.

The rotated component matrix (Before)

Rotated Component Matrix[a]

	Component						
	1	2	3	4	5	6	7
I would rather communicate with a robot than a human when I need service.	.737						
I would rather have a robot serve me than a human.	.714						
The hotel's robot service delivered the best service.	.705						
Among the other services, I would rank the robot service #1.	.671						
I would rather communicate with a service robot.	.610						
Robots are fascinating to me.	.558						
I'm pleased with robot service.	.554						
Interacting with robot services is enjoyable for me.	.522			.522			
The robot communicating to me will be fun for me.	.513			.513			
I feel protected against virus transmission when a robot is performing the service.		.828					
For my virus protection, I prefer to use a robot for services.		.720					
Robots are more hygienic and safer than people.		.655					
I favor a contactless room service delivery.		.620					
I prefer to have contactless room service.		.503					-.402
Robot service will be faster than human service.			.822				
Robot service is fast.			.786				
I can save more time with a robot service.			.703				
If I use the robot service, I will quickly receive my request.			.580				
I believe robot service will make fewer mistakes than people.			.556			.495	
I'm not afraid of robots.				.700			
I don't find robots frightening.				.680			
I think robots are adorable.	.411			.589			
Robot service as self-service is available 24/7		.410		.533			
I worry about issues brought on by robot services.					.759		
I would rather check in and out using contactless technology.				.402	.419		
Using a robot's service, I won't be afraid to break it.						.529	
I believe a robot will assist me in getting the service I need.						.513	
When using robot services, I'm concerned about privacy issues.							.630

The rotated component matrix (Before)(cont.)

When dealing with a robot, I won't be worried if I make a mistake.							.516

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
[a]

a. Rotation converged in 22 iterations.

The table demonstrates the initial result. The research came out with 7 components, that is still too much. Therefore, this research tries to have it to have only 3 to 5 components. To reduce the number of components, the scree plot should clean the dimension reduction or the data. This will cut by the basic 3 rules which are low factor loading, cross loading, and mismatch meaning. The first data that has been cut was “When dealing with a robot, I won't be worried if I make a mistake.” as it is a mismatch meaning and lowest score from 7 components. As a consequence, the data will continue to be cut one by one to make the data clear at the final.

Cross Tabulation

Crosstabs Spend per room night * Gender

How much do you spend on the room price per night? * What is your gender? Crosstabulation

Count

		What is your gender?			
		Male	Female	LGBTQ	Total
How much do you spend on the room price per night?	Below 1,000 Baht	5	0	0	5
	1,001 to 5,000 Baht	30	82	4	116
	5,001 to 10,000 Baht	13	18	1	32
	Above 10,000 Baht	2	1	0	3
Total		50	101	5	156

According to the table, all the genders are male, female, and LGBTQ. They prefer to spend a room night at 1,001 to 5,000 Baht. Following with the price between 5,001 to 10,000 Baht.

Crosstabs ITU * Gender

I intent to select a hotel with robot service * What is your gender? Crosstabulation

Count

		What is your gender?			
		Male	Female	LGBTQ	Total
I intent to select a hotel with robot service	Strongly Disagree	2	4	0	6
	Disagree	7	16	4	27
	Agree	20	45	1	66
	Strongly Agree	21	36	0	57
Total		50	101	5	156

Most of the genders "Agree" to select a hotel with robot service. For Male, 20 of 50 of them "Agree" and 21 of 50 are "Strongly Agree". For females, 45 of 101 of them "Agree" and 36 of 101 are "Strongly Agree". However, LGBTQ people "Disagree".

Crosstabs ITU * Age

I intent to select a hotel with robot service * Could you please tell me how old are you? Crosstabulation

Count

		Could you please tell me how old are you?				
		20 - 25 years old	26 - 30 years old	31 - 40 years old	More than 40 years old	Total
I intent to select a hotel with robot service	Strongly Disagree	0	4	1	1	6
	Disagree	0	19	4	4	27
	Agree	5	36	18	7	66
	Strongly Agree	4	38	11	4	57
Total		9	97	34	16	156

All the age ranges are mostly "Agreed" to select a hotel with robot service in the number of 5 people "Agree" in age between 20-25 years old. 36 People who are 26 - 30 years old "Agree". 18 people of 31-40 years old and 7 people who are more than 40 years old "Agree" to select a hotel with a robot service.

Crosstabs ITU * Monthly Personal Income

I intent to select a hotel with robot service * Please provide your monthly personal income? Crosstabulation

Count

		Please provide your monthly personal income?					
		20,000 Baht or less	20,001 - 40,000 Baht	40,001 - 60,000 Baht	60,001 - 80,000 Baht	More than 80,000 Baht	Total
I intent to select a hotel with robot service	Strongly Disagree	0	1	3	0	2	6
	Disagree	2	7	8	3	7	27
	Agree	4	22	13	11	16	66
	Strongly Agree	5	11	13	8	20	57
Total		11	41	37	22	45	156

Each level of monthly personal income, they all “Agree” with the intention to select a hotel with robot service. 66 people out of 156 respondents “Agree”. There are 4 people who “Agree” from income between 20,000 Baht or less, 22 people “Agree” from income 20,001 - 40,000 Baht, 13 people “Agree” from 40,001 - 60,000 Baht, and 16 from more than 80,000 Baht.

Crosstabs ITU * Type of guest

I intent to select a hotel with robot service * Which type of guest are you most when visiting a hotel? Crosstabulation

Count

		Which type of guest are you most when visiting a hotel?					
		Solo Traveler	Couple Traveler	Family Traveler	Group Traveler	Business Traveler	Total
I intent to select a hotel with robot service	Strongly Disagree	0	2	3	1	0	6
	Disagree	1	14	8	3	1	27
	Agree	2	33	22	8	1	66
	Strongly Agree	5	29	19	2	1	56
Total		8	78	52	14	3	155

Most of the respondents are Couple Travelers who mostly “Agree” with the intent to select a hotel with robot service. With a number of 33 people from 78 Couple Travelers are “Agree”. Following with 22 out of 52 for Family Travelers “Agree” to select a hotel with robot service. 8 people from 14 Group Travelers also “Agree”. Solo Travelers mostly “Strongly Agree” with the intention to select a hotel with robot service.

Crosstabs ITU * Occupation

I intent to select a hotel with robot service * Please indicate your occupation? Crosstabulation

Count

		Please indicate your occupation?					
		Student	Office worker	Self-employed	Homemaker	Others	Total
I intent to select a hotel with robot service	Strongly Disagree	0	6	0	0	0	6
	Disagree	1	13	6	0	7	27
	Agree	1	34	17	1	13	66
	Strongly Agree	5	29	16	0	7	57
Total		7	82	39	1	27	156

The majority of all occupancy “Agree” with the intention to select a hotel with robot service. For students, there are 7 students, 5 of them “Strongly Agree”, 1 of them “Agree”, and 1 of them “Disagree”. For office workers, there are 82 of them. 34 people “Agree”, 29 of office workers “Strongly Agree”, 13 of them “Disagree”, and 6 of them “Strongly Disagree”. For the self-employed, there are 39 people. 17 “Agree”, 16 “Strongly Agree”, and 6 “Disagree”. 1 homemaker “Agree” with the intention to select a hotel with a robot service. For other occupations, there are 27 of them, 13 of them “Agree”, 7 of them “Disagree”, and 7 of them “Strongly Agree”.

Crosstabs ITU * Spending per room night

I intent to select a hotel with robot service * How much do you spend on the room price per night? Crosstabulation

Count

		How much do you spend on the room price per night?				
		Below 1,000 Baht	1,001 to 5,000 Baht	5,001 to 10,000 Baht	Above 10,000 Baht	Total
I intent to select a hotel with robot service	Strongly Disagree	0	4	2	0	6
	Disagree	0	22	5	0	27
	Agree	2	50	13	1	66
	Strongly Agree	3	40	12	2	57
Total		5	116	32	3	156

There are 66 people who “Agree” with the intention to select a hotel with robot service. 57 of all the respondents “Strongly Agree”, 27 of them “Disagree”, and 6 of them “Strongly Disagree”. People mostly spend around 1,001 - 5,000 Baht for a room night. There are 116 from all the respondents who spend that amount. 50 of them “Agree”, 40 of them “Strongly Agree”, 22 of them “Disagree”, and 4 of them “Strongly Disagree” with the intention to select a hotel with robot service.