

**AN INVESTIGATION OF MATURE TRAVELERS' USAGE INTENTION  
OF INTELLIGENT VOICE ASSISTANTS IN HOTELS**

by

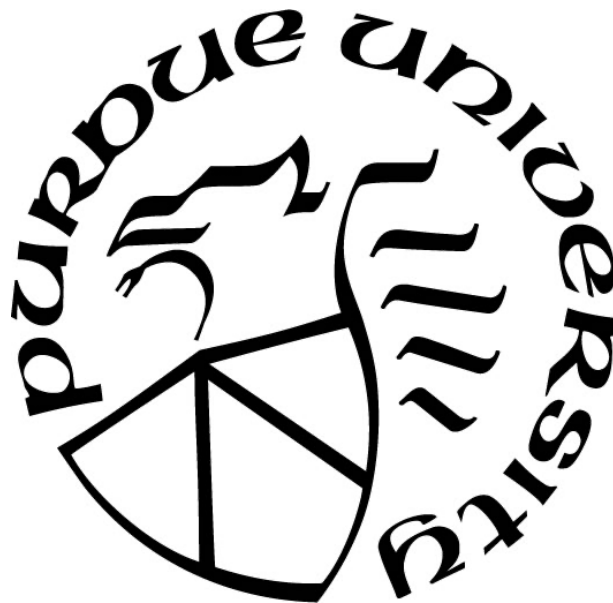
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*Dedicated to my parent*

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## TABLE OF CONTENTS

LIST OF TABLES.....	7
LIST OF FIGURES .....	8
ABSTRACT.....	9
CHAPTER 1. INTRODUCTION .....	10
1.1 Research Background .....	10
1.2 Research Objectives.....	13
1.3 Definition of Terms.....	13
1.4 Organization.....	14
CHAPTER 2. LITERITURE REVIEW .....	15
2.1 Intelligent Voice Assistant.....	15
2.1.1 Voice-based Technology .....	16
2.1.2 Internet of Things .....	17
2.1.3 Intelligent Technology and Mature Travelers .....	18
2.2 Development of Technology Acceptance Models.....	19
2.2.1 The Technology Acceptance Model.....	20
2.2.2 Model of PC Utilization.....	20
2.2.3 Innovation Diffusion Theory .....	21
2.2.4 The Unified Theory of Acceptance and Use of Technology .....	21
2.2.5 Mature Travelers' Acceptance of Technology .....	23
2.3 Trust in Service Technology .....	23
2.4 Conceptual Development.....	25
2.4.1 Performance Expectancy .....	26
2.4.2 Effort Expectancy .....	26
2.4.3 Self-efficacy.....	27
2.4.4 Anxiety .....	27
2.4.5 Social Influence .....	28
2.4.6 Trust.....	28
CHAPTER 3. METHODOLOGY .....	31

3.1 Qualitative Study .....	31
3.1.1 Data Collection .....	31
3.1.2 Instrument .....	31
3.2 Quantitative Study .....	33
3.2.1 Data Collection .....	33
3.2.2 Instrument .....	35
CHAPTER 4. RESULTS .....	37
4.1 Qualitative Study .....	37
4.1.1 Sample Profile .....	37
4.1.2 Performance Expectancy .....	38
4.1.3 Effort Expectancy .....	42
4.1.4 Self-efficacy .....	43
4.1.5 Anxiety .....	43
4.1.6 Social Influence .....	44
4.1.7 Trust .....	44
4.1.8 Additional Findings .....	45
4.2 Quantitative Study .....	47
4.2.1 Descriptive Analysis .....	47
4.2.2 Factor Analysis .....	50
4.2.3 Confirmatory Factor Analysis .....	53
4.2.4 SEM Analysis .....	55
CHAPTER 5. CONCLUSION AND DISCUSSION .....	59
5.1 Summary .....	59
5.2 Discussion .....	60
5.3 Theoretical Implication .....	62
5.4 Practical Implications .....	64
5.5 Recommendation .....	65
5.6 Limitations and Future Research .....	67
REFERENCES .....	68
APPENDIX A. INTERVIEW QUESTIONNAIRE .....	86
APPENDIX B. SURVEY QUESTIONNAIRE .....	88

## LIST OF TABLES

<b>Table 1</b> Demographic Profile and Use Experience of Interview’s Participants.....	32
<b>Table 2</b> Demographic Profile of Online-survey’s Participants .....	34
<b>Table 3</b> Measurement Scale Items .....	36
<b>Table 4</b> Summary of Interview’s Participants.....	37
<b>Table 5</b> Result of Descriptive Analysis to Each Item .....	48
<b>Table 6</b> Result of Descriptive Analysis to Each Factor .....	49
<b>Table 7</b> Result of Exploratory Factor Analysis.....	52
<b>Table 8</b> Result of Convergent Validity .....	54
<b>Table 9</b> Result of Discriminant Validity .....	54
<b>Table 10</b> Result of Hypothesis .....	57
<b>Table 11</b> Result of Mediating Effect.....	58
<b>Table 12</b> Result of Independent Samples Test.....	58
<b>Table 13</b> Group Statistics of Behavioral Intention by Gender .....	58
<b>Table 14</b> Useful Functions of IVAs .....	61

## LIST OF FIGURES

<b>Figure 1</b> Conceptual Model.....	30
<b>Figure 2</b> Revised Conceptual Model.....	51
<b>Figure 3</b> Structural Equation Model.....	56



## **ABSTRACT**

With the development of advanced technology, intelligent voice assistants (IVAs) have emerged as popular service devices. In the hospitality industry, major hotel chains have installed ‘Alexa for Hospitality’, a representative of IVAs, in guestrooms for customer service. Although the voice-based technology obtained huge attention of the public, there is little understanding of the factors that motivate people to use IVAs in hotel rooms. Additionally, mature travelers’ viewpoints towards this technology got less concern in the academic field, though the rapid growth of aging population makes mature adults a big part of guests staying at hotels.

Considering the forever evolving technology and the especially affected group – mature travelers, traditional technology acceptance theories may not be sufficient to achieve the goal of this study, an updated model is needed. Therefore, a mixed method approach including a qualitative interview and a quantitative study of an online survey is applied. The first stage is the qualitative interview which aims to improve the proposed conceptual model for a comprehensive understanding of mature travelers. An online survey is utilized to assess the conceptual model and the consequent hypotheses. The final model includes five determinants: performance expectancy, effort expectancy, social influence, self-efficacy and anxiety, as well as the mediator of trust that is discovered from the qualitative interview. The findings of the quantitative study show that mature travelers’ intention to use the IVAs at hotels is motivated by performance expectancy and social influence. Trust and behavioral intention partially mediate the relationship between these two variables. Effort expectancy and anxiety show no significant effect on mature travelers’ behavioral intention.

This research contributes to the service technology literature with empirical evidences to delineate the behavioral pattern of this customer group. Managerially, the current research provides practical guidelines to the hospitality practitioner for a better understanding of a particular market segmentation: mature travelers.

# CHAPTER 1. INTRODUCTION

## 1.1 Research Background

Technological revolution and growth of mature population are two big challenges of today (Kim & Preis, 2016) that affect the hospitality industry significantly. As an important research topic in these decades, technology continues to push the society in the forward direction (Xiang, 2018). In order to improve the efficiency and release human effort, a lot of advanced technologies are being brought into existence, such as artificial intelligence, automated systems and Internet of Things, and are being applied in extensive fields (Hough & Kobylanski, 2009). Intelligent Voice Assistant is a product of artificial intelligence, combining a natural voice with modern technologies to achieve people-machine communication (Dumaine, 2018). Apple's Siri, Google's Assistant, and Amazon's Echo and Alexa are the major representatives of this technology (Hoy, 2018). These machines are triggered by keywords, and start to provide the required services when they recognize them. For example, Siri launches itself upon receiving or hearing the keywords "Hey Siri", and Alexa is wakes up by the call of "Alexa". The voice of the user is recorded and sent to the server. Then, the requested information or service is provided accordingly (Sen et al., 2015). Due to the voice recognizing feature, which is the most natural means of communication, this technology has been utilized in various settings such as medical cares, automobiles, household and many more industries. In hospitality and tourism, Google launched the KML smart pack assistant to help people to prepare for their trips and journeys. Amazon's Expedia skill enables users to manage their upcoming travel plans by speaking to the device directly. Amazon's Alexa was introduced in hotels, like the Marriott International, to improve customer service experience (Welch, 2018).

The rapidly increasing aging population is a challenge faced by many industries, especially those in developed countries (Chen & Shoemaker, 2014). Due to the development of medicine and technology, the average population has become healthier and live longer than ever before. Therefore, the percentage of mature adults from the total population keeps increasing year by year (Hough & Kobylanski, 2009). In this study, mature travelers are categorized as people aged 55 or above, including baby boomers and older generations (Hudson, 2010). Baby boomers are the main subjects of this study. They born after World War II, from 1946 to 1964, and now they are among 56 to 74 years old. According to the statistics of United States Census Bureau, it is the second-

largest generation in the United States, with about 73 million individuals (America counts staff, 2019). Since 2000, the population of mature adults has expanded every year in the United States. In 2017, 29 percent Americans were found to be over 55 years old. Studies show that the numbers will reach to 33 percent by 2040 (Choi et al., 2019). This change of aging population indicates that mature travelers represent a substantial market and play an important role in the tourism and hospitality industry. Furthermore, they have higher disposable income and more leisure time since many of them are in retired status (Lehto et al., 2008). Hence, in case of hotels, mature travelers do account for a large share of the entire customer base.

Today, people are surrounded by various emerging technologies. However, older generations usually face more difficulties and have a slower pace than the younger generation when it comes to adapting new technologies (Kim & Preis, 2016). Therefore, it is necessary to explore older generation's perspective towards the new technologies that are emerging and are being utilized in hotel industry, as they are one of the most important clienteles of the hospitality industry.

The topic of technology and its implementations in the hospitality and tourism industry is of paramount importance in research. Since 2001, when Connolly suggested that the Information Technology (IT) would be the most powerful force to change the hotel industry (Connolly & Olsen, 2001), technology has become an increasingly popular research theme. With the development of modern technology, more and more cutting-edge digital tools are used in the hotel industry. For example, professional service robots are used to assist guests in some hotels (Ivanov et al., 2017). All kinds of mobile applications are designed and launched to improve customer experiences (Lei et al., 2019). While digitalization makes wireless communication possible, Internet of Things (IoT) is been studied and applied in the hotel industry as well (Nadkarni et al., 2019). More and more technologies are being utilized in different hotel sectors with various functions. Additionally, research also discusses how technology helps in reservation and frontline to improve hotel operation, overall performance, and management efficiency (e.g., Buhalis & Law, 2008; Ip et al., 2011).

Intelligent voice assistant, as an emerging artificial intelligence device, caught a lot attention of researchers. Some studies payed attention to the design and development of the intelligent voice system (e.g., Khosravani et al., 2018; Wang et al., 2009). Some cared about the security and privacy of the system (e.g., Moorthy & Vu, 2015; Polyakov et al., 2018). Some were

interested in its application for controlling home automatic system (Sen et al., 2015). However, in hospitality industry, the research of the intelligent voice assistant is absent. This study was designed to fill the blank. By exploring customers' perspective and usage intention to IVAs in hotels, this study is trying to make contribution to researchers for further study in this field and to the market for investing the assistant in hospitality industry. In addition, mature travelers are the targeted subjects in this study, which filled the researching gap. General population is the group researched most in previous studies (e.g., Nasirian et al., 2017; Purington et al., 2017). Children is another group studied by researchers (e.g., Biele et al., 2019; Druga et al., 2017). Besides, some researchers explored the contribution of the intelligent voice technology on people with disabilities, like vision impairment (Algarni et al., 2013) and mobility impairment (e.g., Masato Nishimori et al., 2007; Pacnik et al., 2005). However, research on mature travelers' usage intention to the intelligent voice assistants is scant. To fill the gap, the current study aims to investigate how mature travelers appraise the voice AI facilities in a hotel setting. While several hotels of Marriott International attempted to install Alexa, an intelligent voice assistant, in their guestrooms to offer better services, this paper for exploring mature travelers' attitude to the machine will bring some significant contributions.

## **1.2 Research Objectives**

To fill the research gap, this study is developed to explore mature travelers' perception of the intelligent voice assistant in hotels and their usage intention. The conceptual model is developed based on previous service technology literature and further updated according to the findings from the qualitative interview. Following that, quantitative study of an online survey is conducted to test the conceptual model and related hypotheses. The main objectives of this research are as follows.

1. What factors influence mature travelers' usage intention of the intelligent voice assistant in hotel rooms?
2. Which factor(s) implicates the strongest impact on mature travelers' usage intention of the intelligent voice assistant in hotel rooms?
3. Is trust the underlying mechanism explaining mature travelers' usage intention of the intelligent voice assistant in hotel rooms?

## **1.3 Definition of Terms**

Prior to further discussion, some terminologies should be clarified based on previous literatures and current study.

- Mature travelers: Travelers who aged 55 or above.
- Intelligent voice assistant: A product of artificial intelligence, combining a natural voice with modern technologies to achieve people-machine communication (Dumaine, 2018).
- Trust in technology: People depend or rely on the technology's attributes under uncertainty and are able to accept vulnerability that it may or may not complete a task (Mcknight et al., 2011).

## **1.4 Organization**

Five main sections are contained in this paper. Chapter 1 gives the introduction of the whole research, including the background, objectives, and organization of this study. Chapter 2 shows the literature review about the intelligent voice technology and assistant, technology acceptance theories and trust in technology. Model and hypotheses are also proposed in this part. Then, a mix methodology (a qualitative and quantitative study) is presented in Chapter 3. After conducting the analysis, the results are explained in Chapter 4. The last chapter – chapter 5 – summarizes the findings of both the qualitative and the quantitative study. Theoretical and empirical implications are also given for future researches.

## **CHAPTER 2. LITERITURE REVIEW**

### **2.1 Intelligent Voice Assistant**

Intelligent voice assistant makes the conversation between a human and a machine possible in order to deliver better service for customers (Lau et al., 2018). The achievement of smart communication requires intelligent machines, and computer is the mainstay of this technology. The computer is not only a calculator, but also holds the sense of behaviors (Turing, 2009). After verifying the intelligence of computer, related programs were created for smart communication.

In 1966, an experiment of intelligent conversation was conducted. Conversational Agent ELIZA, one of the earliest text-based agents, produced a means of natural language communication between human and machine using simple pattern matching techniques (Weizenbaum, 1966). Ten years later, an actual conversation between a human and a machine was achieved using the technology called GUS or Genial Understander System. It was the first experimental computer system that let the machine understand natural dialogs (Bobrow et al., 1977). Representing a travel agent, GUS helped customers reserve their flight tickets by conversation.

Then, a better communication system was found by MIT, called the GALAXY. It had a client-server architecture for accessing on-line information, used spoken dialog with clients to communicate and consisted of a smart “hub”, which connected different computers and domain servers. It had applications in the travel reservation area and provided weather and flight status information as well. However, there were still some drawbacks such as no settlement of a knowledge base and it could only react to anticipated questions (Seneff et al., 1998). To overcome these demerits, another program DARPA was launched. This communication hub acted as a traffic router to control different servers, was able to finish more complicated travel tasks, and procured real-time travel data as well (Levin et al., 2000). At the Microsoft corporate campus, a system called the Bayesian Receptionist dealt with tasks typically handled by front desk and modeled conversation as inference and utilized that knowledge when faced with decision-making problems (Paek & Horvitz, 2013).

Nowadays, more and more firms are engaging into this field and are hoping to leave their own footprint here such as Siri from Apple, Echo and Alexa from Amazon, Cortana from

Microsoft, Google Assistant from Google, Alice from Yandex (Polyakov et al., 2018). Apple's Siri and Google's Assistant were launched in 2010. Four years later, Amazon debuted an intelligent voice assistant - the Echo. It became popular quickly with users across 80 countries (Dumaine, 2018). Subsequently, Alexa from Amazon caught the public's attention too. As time passes, more and more voice-recognition engines are made available and installed in people's homes.

### **2.1.1 Voice-based Technology**

The modern technology relies on the natural voice and artificial intelligence to provide automatic service, making 'voice' the key feature of the whole apparatus. Voice technology is becoming the most common way people interact on the Internet, and hence in due time, the voice-based technology will play a more and more essential role in the society, and in hospitality industry, it will become a normal means of delivering service to guests (Dumaine, 2018).

Voice has become a medium that connects user to the machine. The machine works by listening, recognizing and analyzing the sound. First of all, it listens to the people's voice to obtain the message. When people speak, vibrations are formed in the air; the voice engines pick up those analog sound waves and translate them into digital format. After the machine recognizes the sound, the computer starts to analyze the digital data and artificial intelligence turbocharges the whole process. Lastly, the service providers are able to provide the information or deliver the service depending on the output of the computer (Dumaine, 2018).

The earliest voice-based technology can be traced back to 1950 when Labs created a system called Audrey, that was able to recognize the digits from one to nine when spoken clearly (Dumaine, 2018). Much later, in 1990, a program called Dragon Naturally Speaking was created for processing simple speech (Issenman & Jaffer, 2004). Recently, Apple's Siri, Google's Assistant and Amazon's Echo and Alexa were founded. Depending on level of artificial intelligence present, these devices can listen people's voice, read words and do intended tasks.

Voice-based technology has been researched for a long time and some advantages do make it stand out. When voice is the channel of communication between users and the machine, there is little tech-based knowledge requirement needed by users (Sen et al., 2015). In other words, people who have problems using a particular machine, like aged people, are able to conveniently use this



technology. Also, it is very easy to understand and learn how the features of this technology is operated, so the training time needed is also decreased. Moreover, controlling the machine using sounds can save effort (Sen et al., 2015). When applied in the hotel setting, guests could control in-room facilities, such as lights and TV, and ask for room service in hotel rooms without moving from their place. This would specially benefit the older generation as well as physically handicapped people. However, the voice AI also involves privacy concern and trust issue (Polyakov et al., 2018).

### **2.1.2 Internet of Things**

The intelligent voice technology is closely related to the Internet of Things (IoT). For in-home voice assistant, the IoT enables people to control facilities by speaking directly to the device itself. In hotel rooms too, guests can control facilities in the same way.

IoT is a novel paradigm gaining ground in the modern wireless telecommunication systems (Atzori et al., 2010). As the name suggests, IoT means connecting physical things with the Internet and making them actively take part in the activities concerning the internet (Bandyopadhyay & Sen, 2011). In the research field, it is defined from different perspectives. One is from “Internet”-oriented vision that objects are considered as microcomputers; another one is from “Things”-oriented vision, instead of microcomputers, objects are identified by electronic product code (EPC); the third one is obtained by combining the “Internet” and the “Things” together to create a “semantic”-oriented vision, which introduced a unprecedented level of innovation into today’s information and communications technology (ICT) world. The semantic meaning of IoT is “a world-wide network of interconnected objects uniquely addressable, based on standard communication protocols” (European Commission, 2008, p. 4). The Things in IoT, including Radio-Frequency Identification (RFID) tags, sensors, actuators, mobile phones etc., can interact with each other and cooperate with neighbors via unique addressing schemes (Ashton, 2009).

It is a new form of communication between people and things, and between things themselves, which produces a new dimension for communication and procures information. The immediate access to information is able to improve the efficiency and productivity (Bandyopadhyay & Sen, 2011). Analysts predict that the worldwide IoT market will grow up to \$1.7 trillion in 2020 with a compound annual growth rate (CAGR) of 16.9% (Ellis et al., 2015).

By 2025, Internet nodes may reside in almost all everyday things – food packages, furniture, paper documents and more. Because of the IoT forecasted by NIC, the technology will be applied deeply to meet customers' demand and then contribute to the development of economy (Ashton, 2009).

Therefore, facilitated by IoT and voice technology, the smart guestrooms in hotels have become a reality. Hotel guests are able to control in-room facilities by speaking to the intelligent voice assistant that is connected to IoT. For instance, as soon as the guests speak to the voice AI assistant in hotel rooms: “turn off the lights”, the lights will turn off with the help of IoT.

### **2.1.3 Intelligent Technology and Mature Travelers**

Mature travelers are older generation comparing with young people, so more physical problems and cognitive impairments would be happened on them than on younger generation. Intelligent technologies are good tools to cope with these issues (Pollack, 2005). Proved by previous research, technologies are able to help older people live a healthier, more independent, and more socially engaged life (Chen & Chan, 2014). The intelligent voice assistant in hotels can not only provide services, but also alleviate older people age-related issues. Hence, it makes them capable of travelling alone without any worries and get better travel experience.

Previous studies have thrown light on various intelligent technologies on helping with mature generation's problems. Pollack studied an assistive technology which could help older people with cognitive disorders (Pollack, 2005). By tracking the person's daily behaviors and reporting the same to the caregiver, the assistant is able to record the person's performance and cognitive levels regularly. In addition, a text-to-speech device with AI technology was developed to help people with weak vision; an intelligent hearing aid was designed for people with hearing problems (Directionality, 2004); and for people with limited mobility, controlling household appliances can be achieved by wearing an intelligent device and executing simple hand gestures (Starner et al., 2000). These advanced technologies for assisting the older generation find applications mostly in home and medicine. The artificial intelligence technology used in homes can increase the quality of older generation's life, because they can easily utilize facilities without much movement, and some assistants can replace caregivers too, so that old people could stay at home independently for longer periods of time (Pollack, 2005). Some assistive devices (ADs) also

emerged to aid older people with physical problems. For example, walkers, lift chairs and raised toilet seats can help them perform actions and tasks by themselves (Chen & Chan, 2014).

Although technology does a lot of good to the old generation, it is not an easy task for them to use and employ technology. This generation tends to be less open to advanced technologies and is less likely to accept and attempt using them (Zhou et al., 2012). Back when personal computers and the internet were introduced to the public, many older people kept distance with them. In 2001, around 56 percent of elderly Americans did not use computers, and the group who did use internet at that time consisted of typically male, married, highly educated and rich population who got recommendation by their relatives (Hough & Kobylanski, 2009). Not many researches or studies can be found on the theme surrounding mature travelers' perspective of this advanced voice-based technology. The older generation's standards for accepting new technologies greatly differ from younger generation, this is where the significance of this study lies.

## **2.2 Development of Technology Acceptance Models**

Previous literature proposes major theories and theoretical frameworks to investigate people's acceptance of technology in the service domain, such as Technology Acceptance Model (TAM), Model of PC Utilization (MPCU), Innovation Diffusion Theory (IDT), and the comprehensive theoretical framework of Unified Theory of Acceptance and Use of Technology (UTAUT).

These theories studied the relationship between determinants, behavioral intention and real behavior. In the theory of reasoned action (TRA), behavioral intension was firstly introduced by Fishbein and Ajzen (1977). Representing customers' willingness to use new technologies, behavioral intention shows strong impact on behavior, which is the best predictor of people's real action. The direct and strong connection between behavioral intention and behavior makes this study focuses on the various factors affecting BI and then deciding the behaviors.

### **2.2.1 The Technology Acceptance Model**

Established on the Theory of Reasoned Action (TRA), Davis proposed the technology acceptance model (TAM) (Davis, 1989). In this theory, the behavioral intention is determined by two factors: users' perceived ease of use and perceived usefulness. Perceived usefulness emphasizes on the technology itself, whether it has the capacity of bringing convenience to users. A high perceived usefulness means users believe that the technology is able to improve their own performance. However, a high usefulness of any technology is still insufficient to motivate users. Another variable, perceived ease of use, is also important. Ease of use focuses on users instead of the technology itself. The word "ease" is opposite to difficulty and effort. This factor also strongly affects the behavioral intention. A useful technology may also stop people from using if they find it hard to use. Davis proposed that users prefer applications which are easier to use when other conditions and parameters are kept constant (Davis, 1989). Both of these aforementioned factors are significant in affecting the behavioral intention and are elements that cannot be missed in our research.

TAM has been applied widely in research. The usefulness factor is powerful in predicting the behaviors. Some researchers began to explore the determinants behind the usefulness. In 2000, Venkatesh and Davis extended TAM, combining other theoretical structures with the original TAM. Social influence factors, like subjective norm, image and voluntariness, cognitive instrumental factors, such as job relevance, output quality and result demonstrability, were added to obtain a more detailed and comprehensive understanding of factors affecting the user's behavior (Venkatesh & Davis, 2000).

### **2.2.2 Model of PC Utilization**

Different from TRA and TPB, Triandis put forward a new theory about human behavior in 1997, that was behavioral intention was mainly affected by social factors, affect and the perceived consequences of performing the behavior (Triandis, 1977). Thompson then applied it to the information system to observe PC utilization, hence, the model of PC utilization (MPCU) was founded (Thompson et al., 1991). Six categories are covered in MPCU: job-fit, complexity, long-term consequences, affects of use, social factors and facilitating conditions. The last two elements,

social factors and facilitating conditions, were also considered in the UTAUT later. The variable social influence is the determinant used in this study, based on the situation of this research.

### **2.2.3 Innovation Diffusion Theory**

Besides, Innovation Diffusion Theory (IDT) also made contribution towards exploring the human behavior. Innovation is the core of IDT accompanied by seven variables that are relative advantage, ease of use, image, visibility, compatibility, results demonstrability, voluntariness towards the actual use, and the scope of the research (from a natural environment like agriculture to extended organizations) (Tornatzky & Klein, 1982). In 1991, Moore and Benbasat made use of the innovation feature and utilized IDT to measure information technology (Moore & Benbasat, 1991).

### **2.2.4 The Unified Theory of Acceptance and Use of Technology**

In 2003, researcher Venkatesh formulated a technology acceptance theory called the Unified Theory of Acceptance and Use of Technology (UTAUT), which integrated eight using acceptance theories and models, including Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM), Motivational Model (MM), Theory of Planned Behavior (TPB), combined TAM and TPB (C-TAM-TPB), Model of PC Utilization (MPCU), Innovation Diffusion Theory (IDT) and Social Cognitive Theory (SCT) (Venkatesh et al., 2003). Although these previous theories showed extensive acceptance and application in both academia and industries, and they were all robust models demonstrated different elements affect the intention as well as real behaviors, they used different variables to measure the behaviors (Min et al., 2008). For example, TRA studies in a psychological aspect; TPB emphasizes the power of behavioral control; TAM turns to a different direction, probing the perceived usefulness and ease of use. To solve the limitation, UTAUT was introduced with expanded factors and spread fast. As the most comprehensive technology acceptance theory, and with strong predictive power, it has been applied widely to measure the usage behavior in technologies, such as in e-commerce (Min et al., 2008), mobile banking (Zhou et al., 2010), as well as artificial intelligence (Kessler & Martin, 2017).

In the UTAUT model, four determinants are significant direct determinants of behavioral intention and use behavior, which are performance expectancy, effort expectancy, social influence, and facilitating conditions. The three variables affect behavioral intention and the fourth factor facilitating conditions has a direct impact on use behavior. Also, four key moderating factors, gender, age, experience, and voluntariness of use, are contained in the model.

Venkatesh (2003) defined performance expectancy as “the degree to which an individual believes that using the system will help him or her to attain gains in job performance” (p. 447). In the literature, some authors related this variable with variables from other models, such as perceived usefulness from TAM, job-fit from MPCU. Focusing on task accomplishment, performance expectancy was proved by Venkatesh that it was the strongest predictor of behavioral intention. Effort expectancy means the degree of ease of use of the technology. It is similar to the perceived ease of use (TAM) and complexity (MPCU). It has been shown that this factor only significant at the beginning of using a new product. After a sustained usage, the factor becomes nonsignificant. Next, Venkatesh and other researchers (2003) indicated social influence “the degree to which others’ an individual perceives that important others believe he or she should use the new system” (p. 451). It was represented as the subjective norm in TAM, social factors in MPCU and image in IDT. Also, this element shows a more powerful influence at the earlier stage, and its effect begins to fade when people are familiar with the technology. Facilitating conditions that an individual believes organizational and technical infrastructures can provide support of using the system, similar with the facilitating conditions in MPCU and compatibility in IDT. Previous studies found that facilitating conditions became nonsignificant to behavioral intention when performance expectancy and effort expectancy were presented together in the model, so in UTAUT, the impact of facilitating conditions was only discussed on use behavior.

Self-efficacy and anxiety are not direct determinants in UTAUT. However, they are significant and important determinants in social cognitive theory (SCT). Self-efficacy means people’s beliefs to their capabilities to execute actions. It is a key factor that highly affect the real behavior (Bandura et al., 1999). Besides, physical and emotional states could also affect their capabilities (Gilbert et al., 2003). Anxiety, as a low emotional efficacy, would influence people’s behavioral intention negatively.

### **2.2.5 Mature Travelers' Acceptance of Technology**

Mature people tend to have more physiological and psychological difficulties than the younger generations (Farage et al., 2012), hence, the technology acceptance pattern of mature adults is different. Firstly, due to age-related visual and hearing problems faced by older people, their commitment towards applied effort may be different from young people (Chen & Chan, 2014). People with visual impairment find it harder to use the technologies which employ graphics or text, such as mobile phones. Similarly, people with hearing impairments find it inconvenient to use the technologies based on sound, like intelligent voice assistants. The subject of this study is the sound-based technology which people with hearing disorders don't find useful, whereas people with weak vision could benefit a lot from this technology and their effort expectancy would be different from others.

Secondly, as the age of a person increases, the sensory and motor performance decreases and the movement time slows down by around 200 percent (Stelmach et al., 1987). For some technologies such as mobile phones and computers, such age-related problems may increase difficulties, as clicking or pressing small buttons are required in these devices. However, for voice-based devices, such as Alexa or Google assistant, the problems faced are easily resolved with help of the voice feature. Without any clicking or pressing of exact buttons on the screen, tasks could be performed via simply talking to the machine. In hotel rooms, IVAs enable people to control room facilities by using their voice, rather than by looking for and pressing buttons and switches everywhere, which is inconvenient for those with slow mobility.

Lastly, because of lower cognitive ability than young people, mature people have more difficulty in understanding how new technology is operated (C. S. C. Lim, 2010). It takes them more time and energy to learn and grasp new skills. Therefore, these unique characteristics of the mature population calls for a new research based on their perspective and acceptance of IVAs in hotels.

## **2.3 Trust in Service Technology**

Trust issue is a frequently discussed topic in the service technology acceptance research (Johnson, 2007). Perceived trust shows significant impact on customers' acceptance and the consequent behavioral intentions of new technologies (Min et al., 2008), such as e-commerce,

mobile phones and the self-service technology (Bhattacharjee, 2002). Technology is complex, especially the artificial intelligence and automated technologies, which contain more variations and require to perform in uncertain, unplanned circumstances (Thrun, 2004). People cannot master it easily and need to rely on trust in some way. Without trust, no matter how good or useful the technology is, people may refuse to make use of it (Muir, 1987).

In general, trust is established between human to human, showing people's willingness to depend on another party (Rousseau et al., 1998). Even in the early Information System (IS) domain, researchers explored the trust between users and Internet vendors, rather than the technology itself (e.g., Gefen et al., 2003; Lim et al., 2006). Then, Mcknight and other researchers (2011) began to study people's trust on technology itself. Different from the traditional offline trust that emphasizes interpersonal relationships, trust in technology or online trust connects human to machine. It represents people's expectations of technically competency, persistence and responsibility on the technology. At the same time, since technology lacks conscious volition, so this type of trust happens on a risky basis and is prone to failure, and customers must take the responsibility for actions to the machine. In this way, trust in technology was defined as that people depend or rely on the technology's attributes under uncertainty and it involves "accepting vulnerability that it may or may not complete a task" (Mcknight et al., 2011, p. 3).

It exhibits a relationship between two parties: trustor and trustee, focusing on trustor's degree of willing to be vulnerable to the actions of trustee (Mayer et al., 1995). In this study, guests who use IVAs in the hotel are trustors, and the trustee is the intelligent voice assistant. The guests' trust on the IVA indicates that they are willing to take some risk to get services, subconsciously being aware of the fact that they hold limited power to monitor and control the machine. From previous literatures, there are two aspects of trust strongly related to the final using behavior. The first one is derived from the technology itself, that is, the ability of the technology to prove itself trustworthy (Johnson et al., 2008). To achieve this, the intelligent voice technology must be able to handle a fluent conversation with people, give accurate information and ensure that satisfied service is delivered to the guests. In some cases, users trust on the supplier of the machine, that is, the hotel who is providing the IVAs is also considered. In this scenario, users care about their privacy, which is a key element in trust. Since this technology is based on the voice-recognition, users' voice can be recorded when they are utilizing the service. Furthermore, if guests are looking for some information or a personalized service, for example, asking the device about some



locations or to play a specific type of music, their personal preferences can also be collected. This type of trust signifies that customers believe the supplier can keep their personal information well.

As an automated system, three dimensions of trust could be considered in the intelligent voice assistant, that are performance, process and purpose (Lee & Moray, 1992). Performance is associated with functionality. It shows what the machine can do and refers to its capacity or competency to execute intended tasks. For this intelligent machine in hotels, it means customers trust the machine when it equipped with the functions of delivering the promised services, providing information, controlling the room and etc. Process shows how consistently the machine operate. It illustrates an interpersonal relationship with the agent or the machine itself. Integrity, confidentiality and sincerity are the keys to establish customers' trust in this process. For this voice-based machine, customers show their trust when it delivers service precisely and could cope with uncertain situations. At the same time, the safety of customers' personal information can be promised. The last dimension of trust, the purpose, depicts why the machine was developed. In hospitality, this machine was designed for providing service and improving user experience. For mature customers who show more physical and psychological difficulties than younger people, they trust the machine is not only because it provides information and service, but also because it offers convenience, like reducing their mobility by voice control.

## **2.4 Conceptual Development**

Considering the unique voice-based feature of this technology, which enable users to interact hands-free with the machine using solely their voice, traditional technology acceptance models are not suitable for this study. In addition to that, the target group of this study is the mature customers, rather than the general public. Hence, the distinctive characteristics of mature people require a new theoretical model. This mature group-specific voice technology acceptance model is established based on three important determinants (performance expectancy, effort expectancy and social influence) from the UTAUT, and two factors: self-efficacy and anxiety (based on the general attributes of older generation), along with a trust mediator, to assess mature travelers' perceptive and behavioral intention regarding the intelligent voice assistants in hotels.

### **2.4.1 Performance Expectancy**

Performance expectancy indicates the extent to which people believe that technology will enhance their performance. It is one of the strongest predictor of customers' behavioral intentions in technology acceptance (Venkatesh et al., 2003). In this particular study, the main function of IVAs installed in the guestrooms is offering service to guests, so that they could receive hotel information, destination information and in-room services without going outside or calling the front desk, and control the room facilities such as lights and air-conditioner by voice. Especially if we consider older generation, who has more physical, cognitive, or sensory problems than younger generation, the performance expectancy may be of paramount importance in driving mature travelers' use intention of IVAs in hotels.

Thus, the paper hypothesizes that:

**H1:** Performance expectancy positively affects mature travelers' intention to use IVAs in hotel rooms.

### **2.4.2 Effort Expectancy**

Effort expectancy represents the amount of effort users have to undertake to understand the operation of the technology. In other words, how easy the technology is to use. This element carries huge significance at the initial stage, but as people become familiar with the technology, the influence of effort expectancy reduces rapidly (Venkatesh et al., 2003).

Although the voice-based technology is not brand new in the general consumer market, but it is still at a growing stage. Especially in the hotel industry, there are only a few hotels that utilize this voice-based technology to serve guests and most of them are still at an experimental stage. Moreover, the selected group of this study, the mature population, increase the impact of the effort expectancy affecting the use intention.

Hence, the paper hypothesizes that:

**H2:** Effort expectancy positively affects mature travelers' intention to use IVAs in hotel rooms.

### **2.4.3 Self-efficacy**

Self-efficacy is originated from the social cognitive theory. It is the extent to which people believe they are able to perform well at a designed level (Bandura et al., 1999). People prefer to take action when they believe they are capable of meeting set standards and conducting certain performance. People with high self-efficacy are more likely to view difficult tasks as something that should be mastered rather than something to be avoided (Bandura et al., 1999). Self-efficacy is an important factor in technology adoption theories. According to SCT, they are significant determinants of using intention (Min et al., 2008). Furthermore, mature people's ability of adoption is likely to change with the degree of self-efficacy they possess.

Therefore, this paper hypothesizes that:

**H3:** Self-efficacy positively affects mature travelers' intention to use IVAs in hotel rooms.

### **2.4.4 Anxiety**

Anxiety represents a mental condition that shows a negative emotional response in certain situations (Gilbert et al., 2003). People faced with anxiety issues related to technology display fear, apprehension and difficulty when interacting with it and refuse to use it (Çelik, 2011). Anxiety could arise due to different reasons, including the unfamiliar feeling of technology, worries about data safety, and unexpected machine performance (Park & Huang, 2017). Previous studies have revealed the negative relationship between anxiety and behavioral intention: people with high-level anxiety are more cautious when using technology than people with low-level anxiety (Beaudry & Pinsonneault, 2010).

So, this paper hypothesizes that:

**H4:** Anxiety negatively affects mature travelers' intention to use IVAs in hotel rooms.

#### **2.4.5 Social Influence**

Social influence demonstrates the impact of other people, and how much other people's beliefs will affect the individual's perception. This element is based on the subjective norm derived from TRA and UTAUT. It focuses on the extent to which the individual thinks that whether a certain behavior is expected from him or not (Min et al., 2008). This factor shows stronger effect in the earlier stages of using the technology (Venkatesh, 2000). Although this technology is still up and coming in the hotel industry, voice AI assistants like Alexa are popular among consumers as in-home AI assistants. Although some research suggests that social influence only exists in a mandatory setting (Hartwick & Barki, 1994), service technology literature finds that its impact on behavioral intention is relatively stronger for mature generation (e.g., Min et al., 2008; Venkatesh et al., 2003). Hence, this paper hypothesizes that:

**H5:** Social influence positively affects mature travelers' intention to use IVAs in hotel rooms.

#### **2.4.6 Trust**

As an important determinant, trust has been studied a lot in people's acceptance of technologies. However, the research about mature adults' attitude of trusting new technologies is still immature. Zeithaml found that they were concerned more about safety issues of the innovative technology than young people (Zeithaml & Gilly, 1987). Another study found that trust affected the use frequency, rather than whether people use it and the number of time or money spend on it (McCloskey, 2006). While voice AI is new to the hotel industry and relevant regulations and policies are not updated or complete, the customers might have great privacy concerns, which makes trust particularly important to the current study.

In addition, previous research suggests that trust is an important mediator in terms of technology acceptance and usage. For example, trust mediates the relationship between website users and their behavioral intention (Bart et al., 2005). Literature of human-robot interaction also describes trust as the key element in deciding the usage of autonomous technology (Tay et al., 2014). Previous studies also found that trust did not fully mediate the effect of beliefs on behavioral intentions ( Lee & See, 2004), and thus the direct effects of determinants on behavioral intention would retained in the model.

Thus, this paper hypothesizes that:

**H6a:** Trust mediates the positive effect of performance expectancy on mature traveler's behavioral intention.

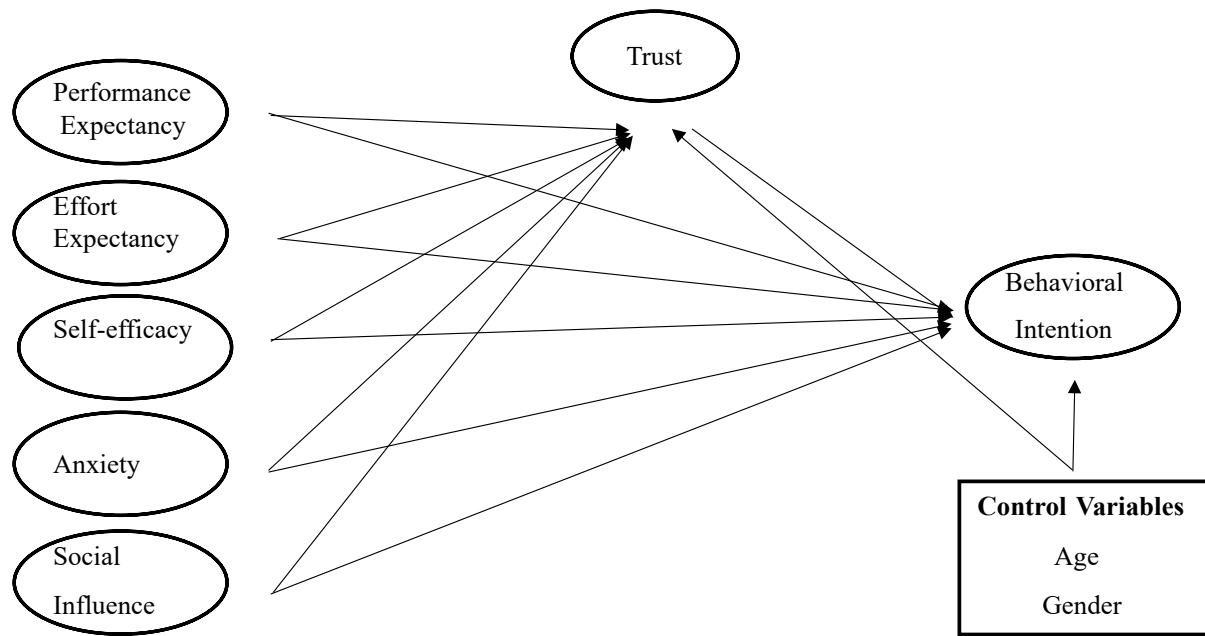
**H6b:** Trust mediates the positive effect of effort expectancy on mature traveler's behavioral intention.

**H6c:** Trust mediates the positive effect of self-efficacy on mature traveler's behavioral intention.

**H6d:** Trust mediates the negative effect of anxiety on mature traveler's behavioral intention.

**H6e:** Trust mediates the positive effect of social influence on mature traveler's behavioral intention.

Age and gender were included as the control variables in the proposed model. The significant moderating effects of age and gender were confirmed in UTAUT (Venkatesh et al., 2003); however, customers' use intention under different genders is not the scope of this study and the study only examines consumers of 55 years old or older. Following the conceptual development, hypothesized relationships are exhibited in Figure 1.



**Figure 1** Conceptual Model

## **CHAPTER 3. METHODOLOGY**

A mixed method, consisting of both a qualitative study and a quantitative one, was employed in this research to explore mature customers' attitude and behavioral intention toward the intelligent voice devices used in hotel rooms. The qualitative study included semi-structured interviews with participants. Following the findings from the qualitative study, an online survey was conducted to collect quantitative data to further verify the proposed hypotheses.

### **3.1 Qualitative Study**

#### **3.1.1 Data Collection**

Following the previous research, this study also sets the targeted group of mature adults as aged 55 years old and above. This age group incorporates most of the customer base in the hospitality and tourism market (Choi et al., 2019). The snowball sample method was used to recruit the participants. The final sample was composed of 12 interviewees aged 55 or above from a Midwest city in the US. Face-to-face semi-structured interviews were conducted with the interviewees' agreement to participate in the study.

#### **3.1.2 Instrument**

Semi-structured interviews were conducted. According to the proposed conceptual model, questions were asked about interviewees' perception towards using the intelligent voice devices (IVAs) in hotel rooms regarding the following aspects: (1) performance expectancy, (2) effort expectancy, (3) self-efficacy, (4) anxiety, and (5) social influence. The survey questionnaire is available as Appendix 1. During the interview, the interviewees expressed their concerns about the reliability and security of the technology. Interview questions regarding trust issues had also been added. Additionally, the interviewees were also asked about their existing experiences of using IVAs and their demographic information (i.e., age group, education level). A total of twelve

interviews were conducted. Table 1 provides a profile of these twelve respondents, including their demographic information and use experience.

With the participants' approval, all the interviews were recorded, transcribed, and reviewed. After review of all the interview transcriptions, common themes and useful information were extracted for further analysis.

**Table 1** Demographic Profile and Use Experience of Interview's Participants

<b>Variable</b> <b>Interviewee</b>	<b>Age</b>	<b>Gender</b>	<b>Educational Level</b>	<b>Do you know how to use IVAs?</b>	<b>Have you ever used any IVAs before?</b>	<b>Do you have any IVAs at your home?</b>
1	55-64	Female	College degree	Yes	A lot	No
2	55-64	Female	College degree	No	Never	No
3	55-64	Male	Graduate school	Yes	A lot	Yes
4	55-64	Female	High school	Yes	A little	Yes
5	55-64	Male	Graduate school	Yes	A little	No
6	65-74	Female	Graduate school	Yes	Never	No
7	55-64	Female	College degree	Yes	Never	No
8	55-64	Female	College degree	Yes	A lot	Yes
9	55-64	Female	College degree	Yes	A lot	No
10	Over 74	Male	Graduate school	Yes	Never	No
11	55-64	Male	College degree	Yes	A lot	Yes
12	55-64	Male	College degree	Yes	A lot	Yes



## **3.2 Quantitative Study**

### **3.2.1 Data Collection**

In the quantitative study, an online survey was conducted to test the hypothesized model. The survey was produced by the Qualtrics platform, and data was collected via the online marketing research panel of Amazon Mechanical Turk (MTurk.com). American participants aged 55 years and older were recruited for the study. The data was collected from March 2020 to April 2020. After eliminating incomplete responses, a total of 216 participants were contained in the final study sample for further analysis. A summary of participants' demographic information is reported in Table 2.

**Table 2** Demographic Profile of Online-survey's Participants

<b>Variable</b>	<b>Category</b>	<b>Frequency</b>	<b>Percentage (%)</b>
Age	55-64	124	57
	65-74	83	38
	Over 74	8	4
Gender	Male	66	31
	Female	150	69
Educational Level	High school	13	6
	Some college education	64	30
	College degree	91	42
	Graduate school	47	22
Ethnicity	Caucasian – Non-Hispanic	188	87
	African American	14	6
	Hispanic/Latino	5	2
	Asian	5	2
	American Indian, Alaskan, Hawaiian, or Pacific Islander	1	0
	Other	3	1
Annual Household Income	Less than \$10K	7	3
	\$10K to \$20K	25	12
	\$21K to \$35K	31	14
	\$36K to \$50K	55	25
	\$51K to \$75K	42	19
	\$76K to \$100K	32	15
	More than \$100K	24	11

### 3.2.2 Instrument

The questionnaire was established on the basis of the proposed model and was further modified based on the new discoveries from the qualitative study. The independent variables of mature consumers' perceptions of using the intelligent voice devices (IVAs): included five determinants: (1) performance expectancy, (2) effort expectancy, (3) self-efficacy, (4) user anxiety, and (5) social influence. The dependent variable is mature customers' intention to use IVAs at hotels. The underlying mechanism of trust is added to the initial proposed model in accordance with the new findings from the qualitative study. All the measured items are adapted from previous literature. Table 3 provides the measurement scale details. All these items were measured using the 7-point Likert scale (1= *strongly disagree*, 7= *strongly agree*). The control variable, that is, the past experience with IVAs and the demographic information were also recorded at the end of the survey. The survey questionnaire is available as Appendix 2.

For statistical data analysis, statistical software SPSS (version 22.0) was utilized to understand samples' demographic information and previous use experience of IVAs, and to analyze the fitness of the original model via exploratory factor analysis (EFA). Then, AMOS Graphics was applied to conduct confirmatory factor analysis (CFA) and the structural equation modeling (SEM) for testing determinants' direct effect on dependent variable, as well as the mediating effect of trust.

**Table 3** Measurement Scale Items

<b>Variable</b>	<b>Question</b>	<b>Reference</b>
Performance expectancy	I feel that the voice assistant is useful at hotel rooms.	(Zhou et al., 2010)
	I think that using the voice assistant at hotel rooms is valuable.	
	I believe that using the voice assistant will save my time when I stay at a hotel room.	
	I think the voice assistant will improve my convenience when I stay at a hotel room.	
Effort expectancy	I think the voice assistant is easy to use at hotel rooms.	
	It is easy to learn how to use the voice assistant at hotel rooms.	
Self-efficacy	I have confidence to use the voice assistant at hotel rooms.	(Yim et al., 2012)
	I do not doubt my ability to use the voice assistant at hotel rooms.	
Anxiety	It may make me nervous to use the voice assistant at hotel rooms.	(Elie-Dit-Cosaque et al., 2011)
	I feel uncomfortable to use the voice assistant at hotel rooms.	
Social influence	Other people recommend me to use the voice assistant.	(Kim & Preis, 2016)
	Other people recommend me to use the voice assistant at hotels for service.	
Trust	I can rely on the voice assistant to get services at hotel rooms.	(Curran & Meuter, 2005; Johnson et al., 2008)
	I believe the voice assistant at hotel rooms is trustworthy to use.	
	I feel safe to use the voice assistant at hotel rooms.	
Behavioral intention	I hope I can use the voice assistant at hotel rooms.	(Kim & Preis, 2016)
	I am eager to use the voice assistant at hotel rooms.	
	I'd like to choose a hotel that provides the voice assistant for guests to use.	

## CHAPTER 4. RESULTS

### 4.1 Qualitative Study

#### 4.1.1 Sample Profile

Table 4 summarized the demographic profile and use experience of interview's participants. Majority are aged in 55-64, have at least college degree and know how to use the machine.

**Table 4** Summary of Interview's Participants

Variable	Category	Number	Percentage (%)
Age	55-64	10	83
	65-74	1	8
	Over 74	1	8
Gender	Female	7	58
	Male	5	42
Educational Level	High school	1	8
	College degree	7	58
	Graduate school	4	33
Do you know how to use IVAs?	Yes	11	92
	No	1	8
Have you ever used any IVAs before?	A lot	6	50
	A little	2	17
	Never	4	33
Do you have any IVAs at your home?	Yes	5	42
	No	7	58

#### 4.1.2 Performance Expectancy

The question “Do you think the intelligent voice assistant is useful in hotel rooms?” was asked to investigate the first dimension – performance expectancy of IVAs - in the proposed model. 11 out of 12 interviewees said yes, which means almost all participants were sure of its usefulness. However, the result shows that interviewees’ behavioral intention does not always follow the confirmation of their perception of usefulness. Follow-up questions regarding the specific useful functions of IVAs were asked. Seven major tasks were covered: (1) general information, (2) hotel information, (3) destination information, (4) in-room service, (5) in-room control, (6) entertainment, and (7) emergency.

##### Function 1: General information

General information included weather and news etc. Interviewees who had used Alexa before reported that they asked Alexa questions and some definitions of unknown words, and this feature could be nifty to utilize in hotel rooms. Some interviewees said they would ask Alexa about the local weather since they were probably in unfamiliar places and would have the requirement of going outside.

- *“Weather is especially important. I want to ask Alexa about the weather conditions outside and the temperature.” (Participant #1)*
- *“Alexa can answer questions, that’s very convenient. Just like I do at home, I would ask the meaning of words or any unrelated questions in the hotel room as well.” (Participant #3)*

##### Function 2: Hotel information

Several interviewees wanted to obtain information about the hotel via IVAs in order to know more about the hotel and enjoy convenience. For example, one interviewee suggested they would ask the assistant for the check-out time; some believed they could be more familiar with the hotel if the assistant could tell more detailed information about the cafeteria, swimming pool, spa center etc.; some participants wanted to know about the activities held by the hotel.

- “... By Alexa, I want to know if I could check-out later.” (Participant #1)
- “If the machine could provide some information about the activities within the hotel or nearby, it would be great.” (Participant #10)

### Function 3: Destination information

Destination information is the function many participants are looking forward to use. They hope to receive the information regarding nearby restaurants, local attractions, interesting places etc. by asking the smart assistant whilst staying inside their hotel rooms. A lot of interviewees hope the assistant can recommend good restaurants and popular attractions. Contrastingly, several participants who make travel plans in advance said that it is a not so attractive function for them since they prefer to collect these resources themselves before the journey, but they did admit that more detailed information, like nearby restaurants, would be good. Some advantages of giving destination information were also mentioned during the interview. For tourists, it is a great and easy way to obtain more information and develop a deeper understanding of the unfamiliar area. For hotels, it will help save labor force and protect the environment since printed travel brochures or books are no longer needed.

- “I think it is a good thing for hotels because hoteliers can cut down the use of paper in guestrooms.” (Participant #2)
- “If Alexa can recommend us restaurants, entertainment centers and interesting places, travel brochures offered by hotels could be replaced.” (participant #3)
- “I may use it to find the closest restaurant, but for more information, I prefer to search the Internet before travel.” (participant #4)

### Function 4: In-room service

Majority interviewees indicated how IVAs could assist in-room services, including housekeeping, ordering food, and asking for amenities such as towels and lotions etc.

- *“Asking Alexa for housekeeping could benefit both guests and the hotel, because guests are able to get the service immediately and housekeepers will know which room should be clean first.” (Participant #2)*
- *“I’d like to use it to order food that the hotel delivers to my room.” (Participant #11)*
- *“I think it will be very helpful if people can request items without having to go outside to ask the front desk.” (Participant #8)*

#### Function 5: In-room control

The function, in-room control, has also been mentioned. This function requires a more advanced technology, such as the Internet of Things, to transform normal facilities into smart ones. Using this, people are able to control their in-room functionalities, such as lights, thermostats, TVs and even coffee machines, by simply speaking to the voice assistant.

However, the interviewees held different opinions regarding this function. More than half the participants confirmed the usefulness of this feature. They do believe it could release their hands and feet of the extra efforts, and facilities can be controlled using their voice. It also saves time since they do not have to find buttons or switches. It is especially beneficial for people with physical disorders, like weak vision or leg disability. On the other hand, some people also said that they would not use this function because of unfamiliarity and preference to traditional methods.

- *“... controlling facilities is great. I hope it can also control the coffee machine.” (Participant #1)*
- *“Of course, that’s a good idea, because it’s always hard to find buttons in hotel rooms.” (Participant #9)*
- *“... then I can say ‘Alexa, turn off the light’ lying on the bed.” (Participant #12)*
- *“I don’t think I’ll use it to control things, because I’ve never tried before.” (Participant #2)*



### Function 6: Entertainment

Many participants believe technology brings fun to in-room activities. The main source of entertainment is playing music, and one participant thinks that this function alone could amount to the difference between intelligent guestrooms and normal rooms. Another one hoped the device could be connected to one's personal cell phone to play music. Other activities such as recommendations of TV channels and movies were also mentioned.

- *"I'll rank the playing music as my favorite function because I like music, especially the classic music. If music-in-room can be achieved, it will be unique." (Participant #3)*
- *"... I will use Alexa to play music, search TV channels and movies." (Participant #10)*
- *"Could it connect to my cell phone? Maybe I will play my own playlist from my phone." (Participant #11)*

### Function 7: Emergency

Considering the health conditions of older generation, emergency functions have also been mentioned by most interviewees. They hope the machine could be of help when a situation requiring emergency action occurs. For example, if they happen to fall in the bathroom, the assistant could be woken to call the hotel staff or 911 or when customers feel uncomfortable or ill suddenly, they can ask Alexa to dial the closest hospital. In this way, mature travelers' feel safer when staying at hotel rooms alone.

- *"If there's emergency, people can say 'Call 911!' to get help." (Participant #2)*
- *"... they could ask how many hospitals are nearby and their locations. That's a significant factor for old people." (Participant #3)*

### 4.1.3 Effort Expectancy

For measuring participants' effort expectancy concerning the IVAs, questions such as “Do you think Alexa is easy to use in hotel rooms?” and “Do you think it is complicated?” were asked. Almost all people said it is simple and easy to use. Those people who had never used it before, also thought it would not be very difficult to learn.

As a follow up, this question was asked: how to encourage and engage people who had never dealt with IVAs before? Interviewees came up with various suggestions. Firstly, the smart assistant should be introduced to the guests before they occupy their rooms. Several interviewees emphasized the effectiveness of face-to-face communication. They suggested that the front-desk employees could introduce the machine to guests and then ask if they want to have one in their guestrooms. Concierge can give an overview about the assistant and show how to use it to avail its offered services. Also, an instruction manual can be provided inside the room, with the introduction of what it is, how it works and what it can do. The instructions should be clear, straightforward and simple.

- *“... Firstly, staff should make the guests aware of the existence of the assistant, or it may scare guests; then they should describe what it is and what it can do. The introduction should be straightforward. For instance, employees can teach customers: You can say ‘Alexa, call 911!’ in case of emergencies”. (Participant #3)*
- *“The face-to-face explanation is important and effective for older people. The introduction of the assistant could take place at the front-desk, before people check-in. Remember, a manual with instructions is also necessary to be provided on the table of guestrooms so that it is easy to spot and will stimulate use.” (Participant #6)*
- *“... In addition to that, maybe hotel staff can lead guests to their room and show them how to use it. One more way of introducing it is the voice machine can automate the introduction on its own, like answering to ‘Who am I’ and ‘You can ask me to do things like ...’” (Participant #9)*

#### 4.1.4 Self-efficacy

The question “Do you have confidence to use the intelligent voice assistant in hotel rooms?” reflects people’s self-efficacy. The result of the interview indicated that almost all participants possessed strong and positive self-efficacy, which means they all had the confidence to use the device in their guestrooms. This factor follows the variables of effort expectancy. The only interviewee who lacked confidence in using IVAs in hotel rooms also had a hard time understanding how to use it. The casual relationship with using intention is not significant, same as in effort expectancy.

- *“I have confidence and the ability to use it.” (Participant #7)*

#### 4.1.5 Anxiety

Regarding the issue of anxiety faced when using the intelligent voice assistant in hotels, nearly half the interviewees expressed their nervousness. When asked, “What make you nervous?”, distrust was revealed to be the biggest reason causing the emotion of anxiety. Some interviewees did not trust the assistant with the recording function; some interviewees did not believe the hotel and the company supplying the intelligent assistant, could keep the guests’ personal information safe. Lack of previous use experience was the second major reason of anxiety as mentioned by few participants. They said they felt nervous because they had never used the assistant before, so they were not sure if they could handle the technology well.

- *“I’m not nervous, it’s easy to use.” (Participant #1)*
- *“Yes, I’ll definitely be nervous, because I feel like it’s watching and listening to me all the time.” (Participant #7)*

#### 4.1.6 Social Influence

In order to measure the social influence, the question “Did you get any recommendations regarding the use of intelligent voice assistants from other people, like relatives or friends?” was asked.

About half the sample responded in favor. Furthermore, some of them even recommended other people to try the smart assistant at home.

- *“I have a lot of friends using Alexa at home, and the reason I use them is because my friends recommended it.” (Participant #10)*
- *“I teach my father who is older than 70 to use Alexa at home, so he can easily control lights and call me.” (Participant #5)*

#### 4.1.7 Trust

Since many participants expressed their distrust towards the voice-based technology, the question “Do you trust the voice-based machine?” was added in the interview. Two-thirds interviewees said that they did not trust the machine in hotels. Only a few of them said they trusted it or they had not considered the trust issue altogether. Therefore, the result shows that trust is a serious factor that has been considered by majority of interviewees. It strongly affects mature travelers’ decision of using the assistant in hotel rooms. All interviewees who chose to trust the intelligent voice assistant in hotels were willing to use it; however, almost all interviewees who said they did not trust the machine showed negative attitude towards its usage in the hotel rooms.

- *“I don’t worry much about Alexa but worry more about the machine requiring my email address, credit card and other personal information.” (Participant #2)*
- *“Actually, cell phone is more unsafe since it is not only listening to me, but also collecting all my information.” (Participant #10)*

A follow up question was asked: “What are your worries about the trust issue?” People expressed their confusion and asked questions in response. First one was the concern about the possession of the device, “Who has the ownership of the machine?” Further, the data collection problem was also a major issue, “Who has access to the data that is collected?” and “How do they deal with the data”? Some also raised the topic of internet security, “Does the public internet promise the safety of my information?” and “What if hackers steal my information and sell it”? The last but not the least question was asked regarding the recording system, “When does the machine start to record?” and “How to make sure the device is not listening to my private conversations”?

The interviewees also gave solutions for enhancing the degree of trust, in accordance to these questions. One-third of the interviewees responded that a privacy sheet promising data security would increase their trust on the machine. Having the option of turning off the machine whenever they want could also release their worries. However, one-third of the individuals also pointed that nothing can establish their trust on the voice-based technology.

- *“How could the hotel guarantee my information safety? ... If they can promise that, I’ll consider using that.” (Participant #4)*
- *“I don’t know if the machine is tracking my conversation, I hope there is option to turn it off.” (Participant #6)*
- *“I just don’t trust it. I don’t trust any electric device.” (Participant #9)*

#### **4.1.8 Additional Findings**

In addition to answering the questions focused around the main determinants of the study, interviewees also expressed their views regarding IVAs applied in the hotel industry. First of all, IVAs were unfamiliar to a part of participants, and that was a reason why they showed less passion towards their usage in hotels. Some also mentioned that people who check in for only one night were more unwilling to use it, because they usually prefer to just relax after returning to their room rather than spending time on figuring out the unfamiliar assistant. For this situation, the

interviewees also gave their suggestions. Hotel staff could help the guest become familiar with the machine by interpreting what it is, how it works as well as the other functions offered by it. One person also conveyed that this problem would be solved after the technology applied widely in the hotel industry.

A benefit of using the assistant in hotels, in case of mature travelers, is the reduction of the degree of fear, as mentioned by some interviewees. Although, for people who know less about the technology, the assistant may contrastingly produce more fear. But it could potentially act as a comfort for those who are anxious around a new and unfamiliar environment. Mature adults find it harder to adapt to an unknown environment, so the smart assistant can help them familiarize themselves to the area and relax the stressed nerve by providing information and entertainment as well, like playing soft music.

- *“... the thing is that, many aged people including me are not used to it. That’s the biggest problem. However, if the device could be applied widely in hotel industry, people will use it.” (Participant #2)*
- *“I think you should consider the mental state of older people. Older people may be afraid in another place. The assistant can help them feel at home.” (Participant #3)*

Consequently, considering the physical difficulties faced by older generation, questions about physical issues were also asked, like vision, hearing or mobility problems. The voice-based technology may produce opposite effects than intended on older people with certain difficulties. Many interviewees agreed with that the assistant would be especially helpful for blind people. One subject answered that people who have difficulty in moving around could benefit a lot from the technology, especially from the in-room control functions. Besides, another interviewee mentioned that people who easily forget things could also receive benefits from it. The voice assistant could help the guest to remember things, such as calling someone and taking medicines. Nonetheless, interviewees believe that this machine does not work for deaf and dumb people.

- *“That’d be great for blind people.” (Participant #1)*

- “... it would be helpful unless guests are not deaf or cannot talk.” (Participant #2)
- “People on chair could rely on it to control lights.” (Participant #6)

The factor of the cost involved was also mentioned by interviewees, and only two persons were ready to pay the extra money for the technology. People who were unwilling to pay extra money stated price-sensitivity and hotel rewards as the two main reasons.

Interestingly, some individuals expressed opposite opinions on the price-sensitive problem. The intelligent machines are more likely to be installed in upper-scale hotels, which means the target customers will not be price-sensitive, and the extra charge would not be a big obstacle for them. Still, it was agreed that the setting of the extra cost should be reasonable and appropriate in order to be accepted by customers.

- “Price is the number one selecting principle for a hotel.” (Participant #6)
- “I will consider the hotel rewards since I am a member of Marriott, so I’d like to choose their hotels.” (Participant #1)

## 4.2 Quantitative Study

### 4.2.1 Descriptive Analysis

The mean values and standard deviation values of the 7 factors with 18 items are shown in Table 5 & 6. It shows respondents’ attitude to each item and factor. Factor effort expectancy ( $M = 5.576$ ) and self-efficacy ( $M = 5.760$ ) have highest means, which means participants feel the intelligent voice assistants are easy to use and they have confidence to use them. However, the values of anxiety ( $M = 4.896$ ), social influence ( $M = 4.686$ ), trust ( $M = 5.025$ ) and behavioral intention ( $M = 4.840$ ) are lower comparing to the last two factors. Especially the factor social influence has the lowest mean, which means that mature participants obtain not much encouragement and recommendation of using the machine.

**Table 5** Result of Descriptive Analysis to Each Item

<b>Factor</b>	<b>Item</b>	<b>Scale Range (Disagree–Agree)</b>	<b>Mean</b>	<b>Std. Deviation</b>
Performance expectancy	I feel that the voice assistant is useful at hotel rooms.	1-7	5.380	1.544
	I think that using the voice assistant at hotel rooms is valuable.	1-7	5.241	1.596
	I believe that using the voice assistant will save my time when I stay at a hotel room.	1-7	5.241	1.548
	I think the voice assistant will improve my convenience when I stay at a hotel room.	1-7	5.380	1.562
Effort expectancy	I think the voice assistant is easy to use at hotel rooms.	1-7	5.560	1.140
	It is easy to learn how to use the voice assistant at hotel rooms.	1-7	5.593	1.113
Self-efficacy	I have confidence to use the voice assistant at hotel rooms.	1-7	5.634	1.294
	I do not doubt my ability to use the voice assistant at hotel rooms.	1-7	5.866	1.143
Anxiety	It may make me nervous to use the voice assistant at hotel rooms.	7-1	4.972	1.885
	I feel uncomfortable to use the voice assistant at hotel rooms.	7-1	4.819	2.014
Social influence	Other people recommend me to use the voice assistant.	1-7	4.662	1.516
	Other people recommend me to use the voice assistant at hotels for service.	1-7	4.630	1.550
Trust	I can rely on the voice assistant to get services at hotel rooms.	1-7	5.440	1.282
	I believe the voice assistant at hotel rooms is trustworthy to use.	1-7	4.819	1.774
	I feel safe to use the voice assistant at hotel rooms.	1-7	4.815	1.797
Behavioral intention	I hope I can use the voice assistant at hotel rooms.	1-7	5.093	1.758
	I am eager to use the voice assistant at hotel rooms.	1-7	4.819	1.897
	I'd like to choose a hotel that provides the voice assistant for guests to use.	1-7	4.607	1.801



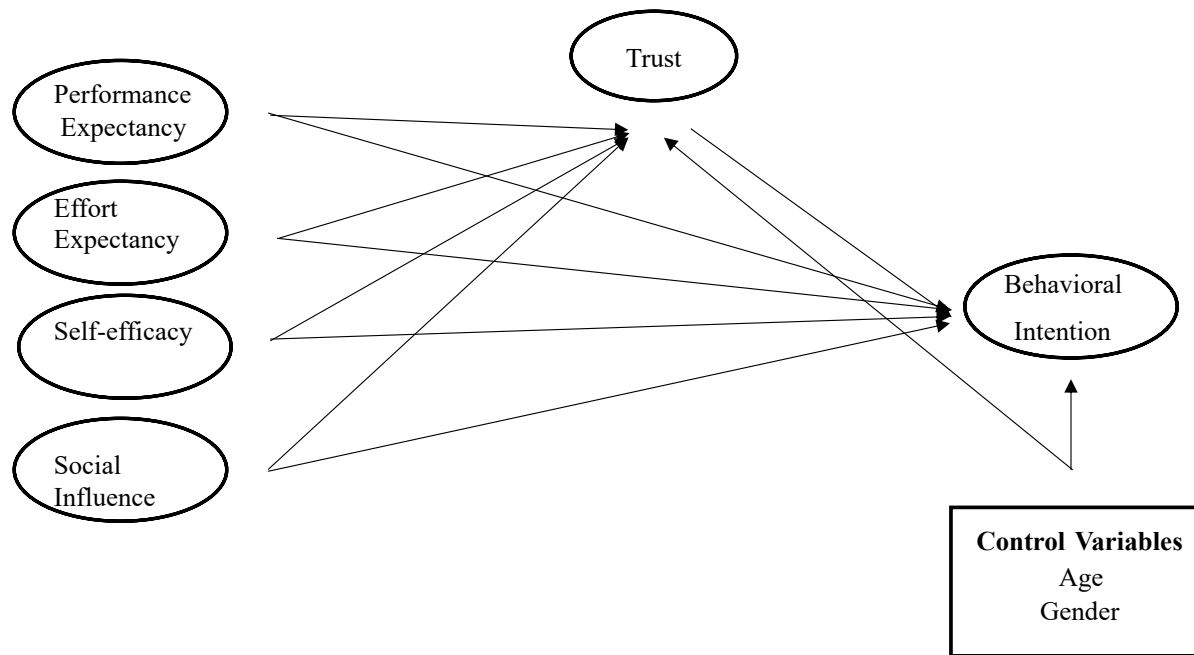
**Table 6** Result of Descriptive Analysis to Each Factor

<b>Factor</b>	<b>Mean</b>	<b>Std. Deviation</b>
Performance Expectancy	5.310	1.475
Effort Expectancy	5.576	1.086
Self-efficacy	5.750	1.089
Anxiety	4.896	1.864
Social Influence	4.646	1.490
Trust	5.025	1.459
Behavioral intention	4.840	1.732

#### 4.2.2 Factor Analysis

Four dimensions consisting of total twelve elements were used to assess mature travelers' use intention of the intelligent voice assistant in hotel rooms. Firstly, an Exploratory Factor Analysis (EFA) was performed to test the fitness of this model. While KMO value equaled to 0.812 and P value was less than 0.001, the 216 samples were deemed suitable for EFA. Next, principal components analysis was used for extracting elements. Three elements were deleted due to low factor loading value (less than 0.50). They were: two questions regarding social influence: "Do other people think it is valuable to use the intelligent voice assistant?" and "Do other people think it is valuable to use the intelligent voice assistant in hotels for service?" and one question regarding trust: "Do you believe the intelligent voice assistant in hotel rooms seldom makes mistakes?".

A varimax rotation approach was followed to categorize variables. Total four dimensions were generated and explained 85.63% of variances. The four factors are performance expectancy, effort expectancy, social influence, and anxiety; they accounted for 47.53%, 16.24%, 12.67%, and 9.19% each respectively. The first factor, performance expectancy consists of four items, and describes mature travelers' expectations concerning the performance of the assistant provided by hotels. The second factor combines effort expectancy and self-efficacy, containing a total of four items. It reflects the degree of effort users expect to put in in order to understand the technology. Social influence interprets how others' opinions affect the user's behavioral intention towards the assistant. Lastly, anxiety reveals older people's emotions related to using the machine in hotel rooms, it involves two items. The new model is presented in Figure 2. and the results are displayed in Table 7.



**Figure 2** Revised Conceptual Model

**Table 7** Result of Exploratory Factor Analysis

<b>Factor</b>	<b>Item</b>	<b>Factor 1</b>	<b>Factor 2</b>	<b>Factor 3</b>	<b>Factor 4</b>
Performance Expectancy	I feel that the voice assistant is useful at hotel rooms.	0.904			
	I think that using the voice assistant at hotel rooms is valuable.	0.901			
	I believe that using the voice assistant will save my time when I stay at a hotel room.	0.89			
	I think the voice assistant will improve my convenience when I stay at a hotel room.	0.88			
Effort Expectancy	I think the voice assistant is easy to use at hotel rooms.		0.859		
	It is easy to learn how to use the voice assistant at hotel rooms.		0.829		
	I have confidence to use the voice assistant at hotel rooms.		0.779		
	I do not doubt my ability to use the voice assistant at hotel rooms.		0.778		
Anxiety	It may make me nervous to use the voice assistant at hotel rooms.			0.94	
	I feel uncomfortable to use the voice assistant at hotel rooms.			0.929	
Social Influence	Other people recommend me to use the voice assistant.				0.942
	Other people recommend me to use the voice assistant at hotels for service.				0.872

### 4.2.3 Confirmatory Factor Analysis

Confirmatory Factor Analysis (CFA) was conducted to test the validity of the model. According to the EFA analysis, 216 samples remained in this structure with four factors. The result verified the applicability of this structure. Considering the limited sample size of this study,  $\chi^2/df$  was applied to measure the overall model fit since it could mitigate the sensitivity of chi-square test (Lehto, 2013). Although the value of  $\chi^2/df$  was 2.351, which was lower than the recommended threshold of 3, the model showed a good fit. Other fit indexes also demonstrated the goodness of the model with root mean square error of approximation (RMSEA) = 0.079, comparative fit index (CFI) = 0.972, normed fit index (NFI) = 0.953, and incremental fit index (IFI) = 0.973. All these fit indexes indicated a good fit of this four-factors model.

The structure also presented a good fit in standardized factor loading, reliability, convergent validity and discriminant validity. The standardized factor loading values ranged from 0.563 to 0.967. Cronbach's alpha was used for assessing the consistency of each dimension. The four variables (performance expectancy, effort expectancy, anxiety and social influence) and mediator trust had high internal consistency with Cronbach's alphas equal to 0.959, 0.867, 0.906, 0.941 and 0.88 respectively, which were greater than the recommended 0.5 threshold. Convergent validity was utilized for testing the construct validity using two values: composite reliability (CR) and average variance extracted (AVE). The range of CR in this study was from 0.864 to 0.956, which was higher than the minimum criteria of 0.7, and the range of AVE was from 0.624 to 0.890, which was greater than the minimum criteria of 0.5 (Claes Fornell, 1981). Table 8 shows the result.

Discriminant validity examined how one variable was different from others. When the corresponding correlation coefficient of each variable was less than the square root of AVE and the absolute value of correlation coefficients exceeded 0.5, the structure had a good discriminant validity (Ramayah et al., 2013). The result is presented in Table 9.

**Table 8** Result of Convergent Validity

	<b>Standardized Factor Loading</b>	<b>Cronbach's Alpha</b>	<b>AVE</b>	<b>CR</b>
Usefulness1 → PE	0.941	0.959	0.846	0.956
Usefulness2 → PE	0.950			
Usefulness3 → PE	0.866			
Usefulness4 → PE	0.920			
SE1 → EE	0.563	0.867	0.624	0.864
SE2 → EE	0.680			
EOU1 → EE	0.932			
EOU2 → EE	0.920			
Anxiety1 → Anxiety	0.919	0.941	0.829	0.907
Anxiety2 → Anxiety	0.902			
SI1 → SI	0.967	0.906	0.890	0.942
SI2 → SI	0.919			
Trust1 → Trust	0.742	0.880	0.736	0.893
Trust2 → Trust	0.924			
Trust3 → Trust	0.897			

**Table 9** Result of Discriminant Validity

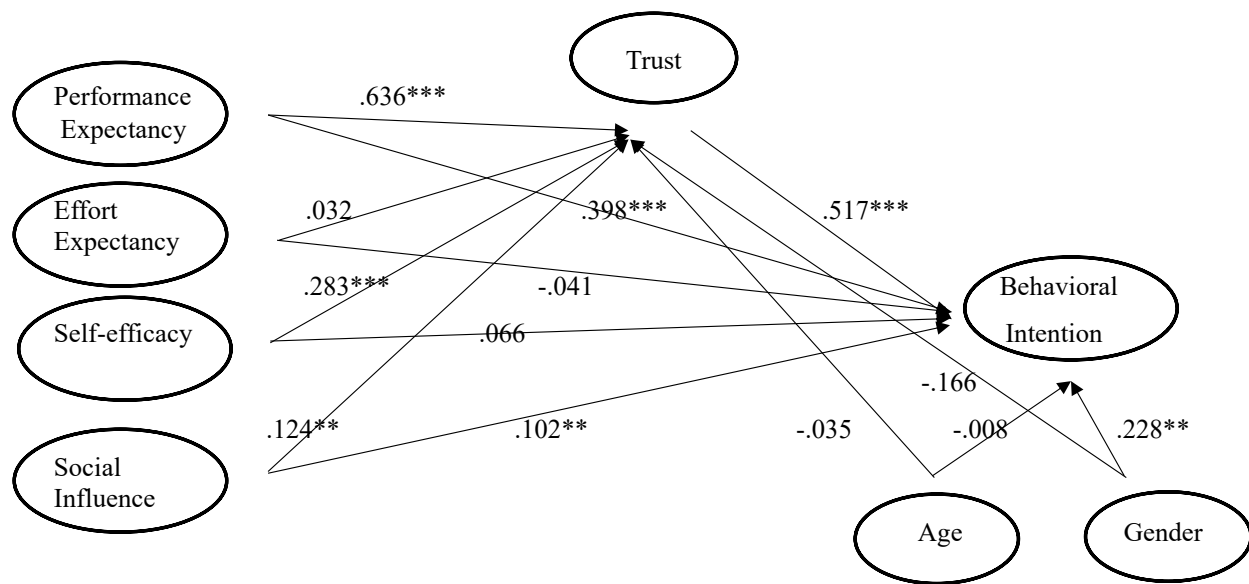
	PE	EE	Anxiety	SI
Performance Expectancy (PE)	0.846			
Effort Expectancy (EE)	0.483***	0.624		
Anxiety	0.46***	0.403***	0.829	
SI	0.444***	0.335***	0.128	0.890
Square root of AVE	0.920	0.790	0.911	0.943

\*\*\* means  $P \leq 0.001$ , Diagonal is AVE

#### 4.2.4 SEM Analysis

Structural equation model (SEM) was conducted to test the hypothesized relationships and mediating effect, shown in Figure 3. This model was mediated by factor of trust and was controlled by age and gender. It has been illustrated that the model is a good fit model with CMIN/DF = 2.182, RMSEA = 0.074, NFI = 0.926, IFI = 0.959, CFI = 0.958.

The result indicates that performance expectancy ( $\beta = 0.398$ ,  $p \leq 0.001$ ) and social influence ( $\beta = 0.102$ ,  $p > 0.05$ ) have significant impact on behavioral intention, so hypothesis 1 and hypothesis 5 are supported. The effect of performance expectancy is stronger than the effect of social influence on mature travelers' behavioral intention. On the other hand, effort expectancy ( $\beta = -0.041$ ,  $p > 0.05$ ) and anxiety ( $\beta = 0.066$ ,  $p > 0.05$ ) does not have a significant impact on behavioral intention, and social influence and self-efficacy belong to the same category, so hypothesis 2, 3 and 4 are rejected. The summary of hypotheses testing is exhibited in Table 10. Hence, mature travelers' use intention is motivated mostly by the performance expectancy of the intelligent voice assistant. Social influence also affects their intention of usage. However, their effort expectancy and the emotion of anxiety do not affect the final use intention.



\*\*\* means  $P \leq 0.001$ , \*\* means  $0.001 \leq P \leq 0.05$

**Figure 3** Structural Equation Model



**Table 10** Result of Hypothesis

Hypothesis		Standardized Estimate $\beta$	Standard Error S.E.	Critical Ratio C.R.	Remark
H1	Performance Expectancy → Behavioral Intention	0.398***	0.074	6.072	Supported
H2	Effort Expectancy → Behavioral Intention	-0.041	0.096	-1.089	Not Supported
H3	Self-efficacy → Behavioral Intention	The factor of self-efficacy was merged with Effort Expectancy after EFA.			
H4	Anxiety → Behavioral Intention	0.066	0.04	1.523	Not Supported
H5	Social Influence → Behavioral Intention	0.102**	0.042	2.724	Supported

\*\*\* means  $P \leq 0.001$ , \*\* means  $0.001 \leq P \leq 0.005$

Trust was hypothesized as the mediator in the model. The mediating effects between determinants and behavioral intention were measured by following the Sobel test (MacKinnon et al., 2007). While the direct effect of performance expectancy and social influence on behavioral intention have been proved, the indirect impacts mediated by trust were also tested. Since effort expectancy and anxiety have no significant effects on behavioral intention, mediating effect of these two relationships would not be discussed in this section. Table 11 shows the result. According to the Bias-corrected 95 Confidence Interval, zero is not included in the lower to upper interval, it means the hypothesis is significant. The confidence interval of H6a is 0.165 to 0.515, and H5e is 0.008 to 0.15. Both H6a ( $\beta = 0.312***$ ) and H6e ( $\beta = 0.059**$ ) are deemed significant. Trust mediates the influence of performance expectancy social influence on mature travelers' use intention of IVAs at hotels. More details will be discussed in the next chapter.

As for the control factors, age has a non-significant impact on trust (Age → Trust;  $\beta = -0.035$ ) and use intention (Age → Behavioral Intention;  $\beta = -0.008$ ), whereas gender shows no significant effect on trust (Gender → Trust;  $\beta = -0.166$ ) but significant impact on use intention (Gender → Behavioral Intention;  $\beta = 0.228**$ ).

**Table 11** Result of Mediating Effect

<b>Hypothesis</b>		<b>Standardized Estimate</b>	<b>Blas-corrected 95CI</b>		<b>Remark</b>
			<b>Lower</b>	<b>Upper</b>	
H6a	Performance Expectancy X Trust → Behavioral Intention	0.312***	0.165	0.515	Supported
H6e	Social Influence X Trust → Behavioral Intention	0.059**	0.008	0.15	Supported

\*\*\* means  $P \leq 0.001$ , \*\* means  $0.001 \leq P \leq 0.05$

A further t-test was achieved to compare behavioral intentions of samples in different age levels (55-64 and 65-74) and genders (female and male). According to the result in Table 12, gender has significant impact on behavioral intention ( $t = -2.065^{**}$ ), whereas people in age 55-64 and age 65-74 have no significant difference in behavioral intention ( $t = -0.825$ ). Table 13 indicates that female (mean = 4.478) show less intention to use IVAs than male (mean = 5.004).

**Table 12** Result of Independent Samples Test

<b>Dependent Variable</b>	<b>Independent Variable</b>	<b>t</b>	<b>df</b>
Behavioral Intention	Gender	-2.065**	126
	Age	-0.825	206

\*\*\* means  $P \leq 0.001$ , \*\* means  $0.001 \leq P \leq 0.005$

**Table 13** Group Statistics of Behavioral Intention by Gender

<b>Gender</b>	<b>Number</b>	<b>Mean</b>	<b>Std. Deviation</b>
Female	67	4.478	1.734
Male	149	5.002	1.712

## CHAPTER 5 CONCLUSION AND DISCUSSION

The final chapter provides a general discussion of the key findings. Both theoretical and managerial implications are highlighted, followed by the limitations of this study and suggestions for future research.

### 5.1 Summary

The development of advanced technology infuses a blooming growth in the hospitality industry. The intelligent voice technology, acting as a representative, was designed to increase work efficiency and offer better services by combining voice recognition with artificial intelligence. At the same time, the population of mature adults in the society is growing faster than anticipated. They tend to play an important role in tourism. However, the relationship between the new innovative technologies and the older generation is still not very strong. On the one hand, some resourceful mature adults may benefit from it but on the other hand, those who find it hard to adapt to new technology may cease their attempts (Hough & Kobylanski, 2009). Therefore, this study was established to gain an insight by understanding mature travelers' perspective and use intention towards IVAs.

The model was established based on previous technology acceptance theories, with five variables (performance expectancy, effort expectancy, self-efficacy, anxiety and social influence), and trust as the mediator in accordance with the semi-structured interview. This model was applied to the quantitative study in order to comprehend mature travelers' perspective towards IVAs and the factors that would affect their use intention in hotels. From the preliminary analysis, it was found that effort expectancy and self-efficacy belonged to the same category, so these two factors were integrated into the effort expectancy variable. The result revealed that performance expectancy and social influence have a significant impact on people's use intention, and both correlations are mediated by trust. Male have higher performance expectancy and usage intention to VIAs than female. An assistant with multiple useful functions is able to increase users' trust on the machine, and hence, encourage the use intention. Others' recommendation can also build trust and stimulate the use intention. Understanding mature travelers' perception towards the new technology installed in hotel will contribute to both theoretical and managerial implication.

## 5.2 Discussion

From both the qualitative and quantitative studies, the four factors (performance expectancy, effort expectancy, anxiety and social influence) show different contributions regarding mature travelers' use intention of IVAs in hotels.

Firstly, performance expectancy has the strongest effect on their behavioral intention. Participants from the interview as well as the online survey admitted the usefulness of IVAs in hotel rooms, and the practicality of the device was found to greatly affect mature travelers' usage of the assistant.

Furthermore, multiple functionalities were portrayed via the qualitative interview, including general information, hotel information, destination information, in-room service, in-room control, entertainment and emergency services. The local weather condition was the most enquired piece of general information by mature travelers; hotel information like the check-out time, the opening time of cafeteria, and the location of spa center was also made available for ease of getting around; destination information included the information of nearby attractions, restaurants and more, for people to familiarize themselves with the local environment. As for in-room control, becoming hands-free was the main purpose of this assistant. Functions concerning in-room services and in-room controls were mentioned a lot in the qualitative study. Without any need of going outside the room or calling the front desk, guests are easily able to avail housekeeping service and room amenities etc. by speaking to the assistant directly. Without having to look for and walk around the room to find switches, guests can control in-room facilities such as lights, air-condition and the TV using the smart machine. Moreover, entertainment is another function that caught the attention of many mature travelers', some people who participated in the qualitative study wanted to play music using this device. Health emergencies are a regular concern for the older generation. They hope the assistant could deal with emergency situations smartly too. For example, if there is an emergency, people could wake the assistant to call 911 or ask the location of the closest hospital. Table 14 exhibits the result of useful functions of IVAs in hotels according to the online survey for the quantitative part of analyses. The function of in-room service was affirmed the most, whereas the entertainment service was the least reckoned among these functions.

**Table 14** Useful Functions of IVAs

Function	Number	Percentage (%)
General information	169	78
Hotel information	161	75
Destination information	159	74
In-room service	170	79
In-room control	158	73
Entertainment	149	69
Emergency	163	75

The second significant element that affects use intention is social influence. This factor comes from individual's social network, like family, friends, co-works and etc. As the closest people, family and friends show the strongest influence on the individual. Within this group, there are culture and value admitted by majority of members, and in order to show strong attachment and belongingness to this group, members are likely to conform to the group norm (Gursoy et al., 2019). When individuals are making a decision, the social influence is a critical determinant. For this new technology in hotel industry, the social group's attitude will be an essential element affecting customers' usage intention. According to the interviewees as well as the participants of online survey, other people's positive attitude to the machine can increase their usage intention, and a recommendation could remarkably motivate them to try.

However, the result shows that the effort expectancy/self-efficacy and anxiety have no significant effect on mature travelers' behavioral intention towards the IVAs. Previous technology acceptance researches have shown that the effort expectancy of older generation is an important factor regarding behavioral intention (Heerink et al., 2010). However, during this study, it was found to be insignificant. From both the qualitative and the quantitative studies, most participants were aware of how to use the machine, even those who had never used or owned one before. Those who were not familiar with the devices said it did not seem very difficult to learn its operations; and they had confidence that they would understand this technology. It was also discovered that anxiety is not a determinant of behavioral intention, though it has strong connection with trust.

Trust exhibits a strong impact on the use intention of mature population, and acts as the mediating effect between variables and behavioral intention. Many participants from the interview

explained their worries about the technology, expressing distrust in different aspects: firstly, they doubted the machine's ability to operate with perfection, "It makes mistakes sometimes and I am not sure it can replace employees in terms of providing services."; they did not trust the security of the technology, "How could it guarantee my data won't be misused?"; those who had seldom used it before doubted its ability to perform as promised. In the quantitative study, trust mediates the relationship between performance expectancy and behavioral intention, anxiety and behavioral intention, as well as social influence and behavioral intention. If the assistant installed in the hotel possesses multiple and useful functions and can perform well, mature travelers will trust the machine better and show more willingness to use it. When more personal recommendations are received from other people, mature adults are more likely to put their trust in it and use it.

### **5.3 Theoretical Implication**

The voice-based technology has been in existence for several years but not many research papers are found in this niche. Some papers discussed the technology itself (Emerick, 2015), some studied the technology applied at home (McLean & Osei-Frimpong, 2019), however, none of them explored the intelligent assistants used in the hotel industry. Therefore, by the selection of this particular theme, this study filled the gap in academic field.

Secondly, the targeted group of this study – mature travelers – is distinct from the subject of other studies. While most research on voice-based technology focuses on the general public (Moorthy & Vu, 2015), this research aims to explore the mature travelers, aged 55 or above. Because of some unique characteristics that belong to the older generation, such as physical problems and unfamiliarity with technology, their perceptions and attitudes towards advanced developments in technology are not the same as in other studies. In this way, the result of this research will throw light on the unexplored technology acceptance areas.

Additionally, this research makes a contribution to the technology acceptance model. The model was framed on previous established models and was extended by the interviews conducted. The unique topic and targeted group made the traditional conceptual model require revision to obtain a more accurate result. People may show different attitudes towards technology at home and technology at the hotel, and these factors may affect the use intention too. For example, the intelligent assistant in hospitality is provided by the hotel and connected to the public internet, but

at home, it is private and owned by people themselves. In this way, trust becomes an important facet to customers when using it in hotels. In order to figure out the factors impacting the use intention in the hotel industry, an interview focused approach has been applied. The result actively shows that trust is a concern for many, and has a mediating effect on the relationship between other factors and people's behavioral intention. Therefore, trust was added into the original model as a mediator, so a new conceptual model was built in the technology adoption field.

The findings exhibit new understanding of the voice-based technology from the point of view of mature travelers. Initially, performance expectancy of the smart assistant was revealed to be the most crucial factor in affecting the use intention. Usefulness of the machine can largely influence customers' use intention, and the specific functions were presented as well. On the other hand, opposite to the proposed hypothesis that people's effort expectancy would affect the use intention, effort expectancy and self-efficacy of mature customers have no significant impact on their final decision. Mature travelers with high ability or confidence to use IVAs cannot improve their use intention in hotels. Besides that, another special finding of this study is that, mature people show strong interest in using or learning about the IVAs, even when they have never used it before. Approximately half the participants of the qualitative and quantitative study revealed they had never used IVAs, but still most of them said it was easy to use and learn.

The issue of trust, however, is the big obstacle for mature travelers to experience IVAs in hotels. Although this issue was mentioned in some previous studies, only a few papers explored this issue about the intelligent voice-based technology and considered it as a mediator. From the interview, a lot of participants expressed their distrust towards the technology. Mostly, they feel unsafe while using the voice feature. Since the machine works by tracking natural voice, people worry about the privacy of their personal conversations in guestrooms. Many people find it hard to believe hotels and technology forms as well. Questions like "How do hotels deal with the recorded voice?" and "How do machine companies guarantee data security?" were raised by many during the interview. In the quantitative study, it is revealed that trust mediates the other factors: performance expectancy, anxiety and social influence, that in turn, motivate the use intention.

## 5.4 Practical Implications

Voice-based intelligent technology is not new to the world. Many products can be found in the market, like Siri from Apple, Google home from Google and Alexa from Amazon. However, its implication in the hotel industry is still in the developing phase. Only countable hotels have applied Alexa in their guestrooms. Whether or not it should be installed in hotels is still a debatable topic. This paper used a mixed approach, combining an interview and an online survey, to understand mature travelers' perception and their use intention, which is able to act as a guideline for the market.

Participants of the interview showed interest in this innovative assistant in hotels. Although the technology exists already in their phones, such as Siri and Google assistant, or their house, like Echo and Alexa from Amazon; in the hotel industry, especially in guestrooms, it is still a new and creative utility. Three aspects should be emphasized for catching mature travelers' attention, that are improving customers' performance expectancy to the machine, enhancing the impact of social influence by other people, and increasing customers' degree of trust to the machine. Firstly, for attracting mature customers, IVAs need to be equipped with appropriate and enough functions. Seven functions (general information, hotel information, destination information, in-room service, in-room control, entertainment and emergency) were mentioned in this study that could be a reference for hotels. While mature travelers may also attempt to use the machine if they receive recommendation from other close people. This could be a good direction for advertisement. The study illustrates that many mature travelers do not trust the machine in hotels, and this is a main reason for refusing to use. As an important discovery, it is necessary for hotels to consider the trust issue as well as the way to increase customers' trust to the machine.

Additionally, the study shows that mature travelers' usage intention of IVAs are different between male and female, and male are more likely to try the smart machine than female. According to the result of this research, hoteliers would have a better understanding of the potential customers, while male mature customers hold more willingness to use IVAs than female mature customers.



## 5.5 Recommendation

From the study, participants show much interest in this smart machine in hotels, so it should be developed continually, and there are some recommendations. While it is installed in guestroom, which has a strong connection with the concept of home or was called “home away from home” (Paletta, 2013), hotels should create the home-like environment of guestrooms. Home is the place where people’s emotional and physical well-being are deeply connected (White & White, 2007). The emotional well-being is tied with social relationships, including family, friends and community. Physical well-being could be achieved when they meet the needs of comfort, control and privacy. Therefore, this hotel technology should have some similar characteristics with the technology at home. With the help of the intelligent voice assistants, guests are able to establish a tight relationship with the hotel, the destination and the community. As well, the assistant is supposed to make guests feel comfortable, controllable and safe in room.

Initially, in order to help guests to establish and sustain the relationship with outside environment, the IVAs should possess enough functions and performance well, especially, the IVAs’ performance is the strongest factor affecting mature travelers’ use intention. By providing service and hotel information, the hotel is able to obtain a closer relationship with customers. For this purpose, hoteliers should input appropriate hotel information into the intelligent machine, and developers are supposed to program the machine in order to understand the guests’ requirement. By providing information about the community, like nearby restaurants, attractions and etc., guests could be more familiar with that place. This task needs hoteliers conduct market research, figuring out what destination information people are interested in, then the assistants will be equipped with the necessary knowledge that customers are looking for.

Then, considering customers’ physical well-being in hotel rooms, the voice-based technology combining with the Internet of Things technology enable guests to control the room facilities for better living experience. Therefore, hoteliers would need to cooperate with the related technology team and employ the Internet of Things technology. Privacy is another serious issue that customers concern a lot, and it is also a strong element affecting mature travelers’ usage intention of IVAs from this study. Many participants in this study exhibited their distrust to the intelligent assistants and worry about the data security. To solve this problem, the efforts of both the hotels and the machine companies are required. Developers of the machine need to revise the privacy policies and provide a tighter security of the machine. The hotels providing the machine

can highlight the safety regulations of the device and make the promise of not misusing the personal information of guests. The result of qualitative study shows that it could relieve customers' distrust to the machine.

In the market, these smart assistants have already been utilized by several hotels, such as Westin Hotels & Resorts, St. Regis Hotels & Resorts, Aloft Hotels, and Autograph Collection Hotels. They could be the reference for hoteliers who are interested in investing these devices. In 2008, Marriott International launched a program called "Alexa for Hospitality" by cooperating with Amazon (Perez, 2018). It installed Echo devices in guestroom to provide guests customized service. Multiple functions were designed for the hotel industry specially. Firstly, it can provide in-room service, like housekeeping, room service and so on. It is a direct channel to connect guests with different departments, such as front desk and concierge. This device is also equipped with the knowledge of hotel information, so people can ask the location of fitness center, the opening time of pool and others. Besides, it could be a tool for entertainment by playing music and radio. According to the functions mentioned by mature people in this study, information about the local destination, in-room control and emergency function could be considered in the future. By working with third-party apps, the device could recommend nearby restaurants, attractions and other interesting places. Connecting with Internet of Things technology, the normal guestrooms will turn to smart ones that people can control the facilities by voice. Lastly, for older customers, designing the emergency function to ensure their safety when staying in rooms alone.

As a new product in the hotel industry, it is not easy to convince customers to give it a try. Accepting it required a multi-stage process. Proved by previous study that social influence is an essential factor affecting customers' attempt to a fresh product (Gursoy et al., 2017). Guests' primary appraisal to the products is greatly from the social influence, that is other people's evaluation to the products, and the closer group, like family and friends, will conduct stronger effect. Therefore, to promote customers to use the machine, instead of highlighting its functions, hotels should introduce it and show the existence of the machine at first. The interviewees in this study presented some specific suggestions regarding this issue. Firstly, the front-desk staff can introduce the assistant and explaining its features. The concierges can show the guests how to use it when leading them to their rooms. A paper instruction manual can be made available inside the guestroom for people to refer. In addition to the basic introduction, hoteliers should also show their customers how other people are willing to use it. By exhibiting and promoting the product via

social media, such as Facebook and Twitter, trying to develop it as a trend and then forming the social norm.

Since installing the intelligent devices is not a cheap investment for hotels, balancing the expense and the income becomes necessary. An appropriate extra charge for the smart room can be applied. Hotels should understand the financial condition of their own enterprise and the expense level of their target customers. Especially, while male customers show more passion on using the machine, hoteliers are supposed to explore more male customers' consuming behaviors for obtaining more customers and revenue.

## **5.6 Limitations and Future Research**

Some limitations that exist in this research and the related suggestions that would help future studies based around the theme of this study are mentioned below. Mature travelers are the focus of this study. However, some important features related to them were not reflected in this research. Physical disorders are a serious issue for older people, but people with different physical problems were not divided into groups for analysis. Due to the problem of limited sample with physical problem, no statistical analysis could have been achieved. Nonetheless, it is a salient factor that can be considered in future studies. Researches can be done regarding the effect of physical problems on behavioral intention. People with different physical issues such as visual problem, hearing problem or problems concerning mobility etc. can be divided into different groups for understanding their perception and use intention.

While age is the main direction studied in this research, researchers can turn the attention to other interesting and important features towards the technology in tourism and hospitality. For example, previous paper found different technological preferences of customers in different age levels and travel purposes (Erdem et al., 2019). In this way, researchers are able to compare attitudes toward IVAs in hotels between leisure and business travelers.

Additionally, the study was limited with 12 samples in qualitative study and 216 samples in quantitative study. In the further study, more samples should be included in order to improve the result accuracy. Also, the sample in this study was restricted to the United States, so for a more generalized result, people from other countries and areas could be investigated in the future.

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## **APPENDIX A. INTERVIEW QUESTIONNAIRE**

### **Intelligent Voice Assistant:**

The Intelligent Voice Assistant is a voice-recognition technology that enables people to interact with a machine. For example, Alexa from Amazon can be activated by calling “Alexa”. You can ask questions, play music, set alarms and get information about the weather, news and many more things.

Some hotels have also installed the intelligent voice assistant Alexa in their guestrooms. Guests can ask Alexa for room service, information about the hotel and the destination, and also use it for entertainment. In addition, Alexa installed in the hotel guestrooms is able to control/adjust the room facilities, such as the room lights, thermostat and TV.

### **Part 1: Performance Expectancy**

1. Do you think the Intelligent Voice Assistant is useful in hotel rooms?
2. What specific functions do you think are useful?

### **Part 2: Effort Expectancy**

3. Do you think the Intelligent Voice Assistant is easy to use in hotel rooms?
4. Do you think the Intelligent Voice Assistant is complicated?

### **Part 3: Self-efficacy**

5. Do you have confidence to use the intelligent voice assistant in hotel rooms?

### **Part 4: Anxiety**

6. Will you be nervous to use the Intelligent Voice Assistant in a hotel room?
7. If yes, what makes you nervous?
8. Do you have any suggestions to reduce the nervousness?

### **Part 5: Social influence**

9. Is there anyone around you using the intelligent voice assistants?

10. Did you get any recommendations for using the intelligent voice assistants from other people, like relatives or friends?

Part 6: Trust

11. Do you trust the intelligent voice assistant?

12. Will you trust the intelligent voice assistant in hotel rooms?

Part 7: Behavioral intention

13. Will you choose the hotel providing the intelligent voice assistant in hotel rooms and why?

## APPENDIX B. SURVEY QUESTIONNAIRE

The Intelligent Voice Assistant is a voice-recognition technology that enables people to interact with a machine. For example, Alexa from Amazon can be activated by calling “Alexa”. You can ask questions, play music, set alarms and get information about the weather, news and many more things.

Some hotels have also installed the intelligent voice assistant Alexa in their guestrooms. Guests can ask Alexa for room service, information about the hotel and the destination, and also use it for entertainment. In addition, Alexa installed in the hotel guestrooms is able to control/adjust the room facilities, such as the room lights, thermostat and TV.

The picture shows the usual functions that Alexa can perform at hotel guestrooms.



*Perez, S. (2018, June 19). Amazon launches an Alexa system for hotels. Retrieved from <https://techcrunch.com/2018/06/19/amazon-launches-an-alexa-system-for-hotels/>*



1. My age is 55 or older.

☐ Yes ☐ No

2. Please indicate to what extent you agree with the following statements:

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I feel that the voice assistant is useful at hotel rooms.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I think that using the voice assistant at hotel rooms is valuable.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe that using the voice assistant will save my time when I stay at a hotel room.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I think the voice assistant will improve my convenience when I stay at a hotel room.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Please select disagree for this question.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3. Please indicate to what extent you agree with the following statements:

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I think the voice assistant is easy to use at hotel rooms.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is easy to learn how to use the voice assistant at hotel rooms.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4. Please indicate to what extent you agree with the following statements:

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I have confidence to use the voice assistant at hotel rooms.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I do not doubt my ability to use the voice assistant at hotel rooms.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

5. Please indicate to what extent you agree with the following statements:

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
It may make me nervous to use the voice assistant at hotel rooms.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel uncomfortable to use the voice assistant at hotel rooms.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

6. Please indicate to what extent you agree with the following statements:

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
Other people think it is valuable to use the voice assistant.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other people think it is valuable to use the voice assistant at hotels for service.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other people recommend me to use the voice assistant.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other people recommend me to use the voice assistant at hotels for service.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

7. Please indicate to what extent you agree with the following statements:

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I can rely on the voice assistant to get services at hotel rooms.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe the voice assistant at hotel rooms is trustworthy to use.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe the voice assistant at hotel rooms seldom makes mistakes .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel safe to use the voice assistant at hotel rooms.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Please select agree for this question.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

8. Please indicate to what extent you agree with the following statements:

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I hope I can use the voice assistant at hotel rooms.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am eager to use the voice assistant at hotel rooms.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I'd like to choose a hotel that provides the voice assistant for guests to use.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

9. Do you know how to use the intelligent voice assistant?

- ☐ None at all      ☐ A little      ☐ Moderately      ☐ A lot      ☐ A great deal

10. Have you ever used any intelligent voice assistant before?

- ☐ Never      ☐ Once or Twice      ☐ Sometimes      ☐ Lots of times      ☐ Always

11. Do you have any intelligent voice assistant at your home?

- ☐ No      ☐ Yes, I have One      ☐ Yes, I have Two      ☐ Yes, I have Three  
☐ Yes, I have more than Three

12. Have you ever used any intelligent voice assistants at hotels before?

- ☐ Never      ☐ Once or Twice      ☐ Sometimes      ☐ Lots of times      ☐ Always

13. What function(s) of the voice assistant do you think will be useful at hotel rooms? (You can choose more than one option)

- ☐ None  
☐ General information (e.g. ask for the weather, the news, etc.)  
☐ Hotel information (e.g. check-out time, pool hour, etc.)  
☐ Destination information (e.g. nearby restaurants, attractions, etc.)  
☐ In-room service (e.g. ask for housekeeping, order food, require items, etc.)

- ☐ In-room control (e.g. control the lights, the thermostat, the TVs, etc.)
- ☐ Entertainment (e.g. play music and radio)
- ☐ Emergency (e.g. call 911)

14. Do you have any physical issues?

- ☐ No
- ☐ Yes, in hearing
- ☐ Yes, in vision
- ☐ Yes, in mobility
- ☐ Yes, in others \_\_\_\_\_

15. Which age range are you in?

- ☐ 55-64
- ☐ 65-74
- ☐ Over 74

16. What is your gender?

- ☐ Male
- ☐ Female

17. What is your education level?

- ☐ High school
- ☐ Some college education
- ☐ College degree
- ☐ Graduate school
- ☐ Others

18. What is your ethnicity?

- ☐ Caucasian – Non-Hispanic
- ☐ African American
- ☐ Hispanic/Latino

- ☐ Asian
- ☐ American Indian, Alaskan, Hawaiian, or Pacific Islander
- ☐ Others

19. What is your annual household income?

- ☐ Less than \$10K
- ☐ \$10K to \$20K
- ☐ \$21K to \$35K
- ☐ \$36K to \$50K
- ☐ \$51K to \$75K
- ☐ \$76K to \$100K
- ☐ More than \$100K