MALAYSIAN CONSUMERS' INTENTION TO ADOPT A SMART SPEAKER IN HOME APPLIANCES

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UNIVERSITI SAINS MALAYSIA

2022

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by/oleh

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Thesis submitted in fulfilment of the requirements
for the degree of
Master of Arts

August 2022

ACKNOWLEDGEMENT

I would like to express my gratitude to the individuals who have been there since the beginning of my masters' journey. This thesis became a reality with their kind support and encouragement.

First and foremost, I would like to express my deepest appreciation to my supervisor, Mr. Khairul Anuar, who have been sincere, helpful, and encouraging during my masters' journey. Thank you for sharing your knowledge and all the opportunities you have provided for me.

Second, I would like to thank my best friends who have been supportive and encouraging since the start and have been pushing me to complete this thesis even when times were tough. Your support will never be forgotten. I would also like to thank those who took the time to complete the survey and allowing me to finish this thesis.

Lastly and most importantly, I would like to express my gratitude towards my supportive mother who have been encouraging and kind throughout this journey. Thank you for sharing your knowledge as well. I hope I make you proud with this thesis and graduating with a masters' degree.

TABLE OF CONTENTS

LIST OF TABLES

Page

LIST OF FIGURES

Page

LIST OF ABBREVIATIONS

AI	Artificial Intelligence
ATT	Attitude
BI	Behavioral Intention
IDT	Innovation Diffusion Theory
IoT	Internet of Things
GEN	Gender
PEOU	Perceived Ease of Use
PLS	Partial Least Squares Approach
PU	Perceived Usefulness
TAM	Technology Acceptance Model
TRA	Theory of Reasoned Action
SEC	Security
SPSS	Statistical Package of Social Science

LIST OF APPENDICES

NIAT PENGGUNA DI MALAYSIA UNTUK MENERIMA PAKAI SPEAKER PINTAR DALAM PERLATAN RUMAH

ABSTRAK

Pengadaptasi *"smart speaker"* di banyak negara meningkat dengan ketara selama bertahun-tahun, namun, kadar penggunaan di Malaysia masih rendah. Kajian ini memberikan pandangan mendalam mengenai sikap para pengguna di Malaysia dengan menggunakan *"intention to adopt"* (keinginan untuk mengguna) sebagai variabel dalam menentukan hubungan dan kesan antara faktor lain dan niat untuk diterima pakai oleh pengguna Malaysia. Kajian empirical ini menyoal selidik dalam talian 200 pengguna Malaysia. Hubungan antara variabel bebas (*perceived usefulness, perceived ease of use, security, price*), perantara (*attitude*), dan variabel bergantung (*intention to adopt*) diperiksa melalui analisis regresi, ujian perantaraan Baron dan Kenny (1986), dan lain-lain. Penyelidikan ini juga turut memeriksa jika jantina dan usia mempunyai kesan kepada sikap pengguna Malaysia. Hasil kajian ini menunjukkan bahawa sikap pengguna memainkan peranan penting antara variabel bebas dan variabel bergantung. *Perceived usefulness, perceived ease of use, security* dan *price* adalah pengaruh yang kuat terhadap hasrat pengguna Malaysia untuk mengguna pakai *smart speaker*. Kajian inti telah meluaskan literatur penyelidikan dalam memautkan hubungan antara variabel yang telah dibincangkan. Kajian ini berlaku semasa pandemik COVID19 di mana ramai orang melaksanakan *"Work From Home (WFH)"* ataupun kehilangan pekerjaan. Ini juga boleh memberi impak kepada hasil kajian ini kerana persepsi pengguna telah berubah dan membuat mereka menilai *smart speaker* sebagai mahal dan bukan keperluan harian.

MALAYSIAN CONSUMERS' INTENTION TO ADOPT A SMART SPEAKER IN HOME APPLIANCES

ABSTRACT

The adoption of smart speakers in many countries has increased significantly over the years, however, the adoption rate in Malaysia is still quite low. This study provides insights into the Malaysian consumers' attitude towards intention to adopt smart speakers and evaluates the adoption intention's impact as the mediator in the relationship between factors and intention to adopt. This empirical study is based on an online questionnaire using a sample of 200 Malaysian consumers. The relationship between the independent variables (perceived usefulness, perceived ease of use, security and price), the mediator (attitude) and the dependent variable (intention to adopt) were examined using regression analysis, Baron and Kenny's (1986) tests of mediation, and others. This study also examined if gender and age moderate attitude. The result reveals that attitude plays an important role as it mediates the relationship between the factors and intention to adopt. Factors such as PU, PEOU, security and price are all important factors especially to the Malaysian consumer as this influences their attitude to adopt smart speakers. This study has extended the literature in linking the relationship between attitude, factors and intention to adopt. This study took place during the COVID19 pandemic where many people worked from home or had lost their jobs. This could cause many participants to see smart speakers as expensive and not a necessity which could affect the results.

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter provides an overview of the thesis. This thesis examines Malaysian consumers' intention to adopt a voice application for smart speakers in home appliances. Future studies on consumer behaviour rely on consumers' intention to utilise a product. Consumers' intention to adopt is an appropriate variable when analysing future consumer behaviour and usage.

This chapter commences with a discussion of the broad areas of concern investigated by this thesis, namely the Internet of Things (IoT) and smart speakers. It focuses on how smart speakers work and the benefits of using it. This chapter covers the statement of research problem and discusses the research questions. It also covers the objectives of the study, provides the significance of the study, and shows how this thesis is structured and organized.

1.2 Background of study

Household appliances are now better equipped to integrate with increasingly advanced tech through the Internet of Things (IoT), Artificial Intelligence (AI) and 5G (Gu, Bao, Hao, & Kim, 2019). The internet and web browsers provided the necessity for electronic commerce, while mobile telephone connected to digital transmissions network provided the necessity for mobile commerce (Dholakia & Dholakia, 2004). A new term 'Internet of Things' (IoT) has enabled devices that are able to "communicate, dialogue, compute and coordinate to deliver information" (Kowalczuk, 2018). According to Shammar and Zahary (2019), the goal for the creation of IoT is to create a better world for us. IoT refers to a collection of sensors and devices which are

interconnected through a unified framework, intended to share, and facilitate information (Gubbi, Buyya, Marusic, & Palaniswami, 2013). Therefore, through IoT, the system's 'smartness' is executed by the devices connection. Due to the developments in IoT technology, traditional homes are evolving into smart homes.

Gram-Hanssen and Darby (2018) defined smart home as a home equipped with digital sensing and communications. For smart home, Gram-Hanssen and Darby (2018) separated it into four different categories: safety and control, activities, relation and continuity, and reflection of identity and social status. According to Ding, Cooper, Pasquina, and Fici-Pasquina (2011), smart homes are a physical network system which is associated with household networks which are connected through sensors and intelligent electric appliances. The user-oriented intelligent network housing services are achieved due to the interaction of human and machine between the internet and intelligent electric appliances. Smart home systems generally consist of IoT cloud, smart home platforms (such as mobile applications), terminal devices (such as intelligent electric appliances, and sensors), and a communication network (such as link layer, network layer and application layer) (Ding et al, 2011).

In comparison to the traditional household appliances where users must operate and manage the energy consumption manually, smart household appliances such as heaters, air conditioners, and washing machines are able to be electronically controlled and managed by smart homes. Through installing sensors and intelligent switches on current household equipment, it can be controlled and managed electronically. The smart home system equips user with user-oriented practical and functional services. In order to help reduce user's energy consumption and encourage sustainable development for the environment, the smart home provides reasonable management of household energy sources. In Malaysia, little is known on the adoption of smart

home. However, according to Statista (2021), the revenues of smart home in 2021 is US $195.45 million and it is forecasted to reach US $420.83 million in 2025. On the same survey, the revenue in 2017 was US $40.08 million, which saw 949.98% increase between 2017 to 2021. With the way smart home is designed; making life easy and being more convenient to humans, this shows that there is a good potential to reach more Malaysian consumers over the next couple of years. Smart home includes products that are connected through network via Wi-Fi, Bluetooth or similar protocols, such as controlling temperature, lighting, security, safety or entertainment remotely by a phone, tablet, computer, or a system that is within the home (Wahab, Shamsuddin, Abdullah, Yi, 2018). To create new income courses, smart homes enabled Internet communication and technology (ICT) companies to create a new market segment, smart speakers. The main enterprises that launch smart home services/products in the ICT ecosystem includes Google Home and Amazon Echo.

1.2.1 Smart Speakers

On a smaller scale than the smart homes service, major technology companies also integrated IoT by introducing smart speakers with voice assistant as one of the smart home platforms to be used in smart homes. Gautier and Gestanes (2016) argued that in the form of smart speakers, the voice assistants' competition has now moved into consumers' houses. According to Hwang (2018), smart speakers are defined as speakers which are Wi-Fi connected with an inbuilt voice-activated system. Like smart phones, smart speakers are Bluetooth and Wi-Fi enabled devices which includes the same voice assistant technology. Most smart speakers come without a screen, however there are some with screen such as Amazon Echo Show and Echo Spot, and Google Home Hub (Terzopoulos & Satratzemi, 2020). Smart speakers are supplied with

microphones where users can activate and give commands to the voice assistant (Gautier & Gestanes, 2016). Smart speakers are always listening due to microphone; however, it will be activated to listen when their pre-selected call word or 'wake word' is used. The basic idea of a smart speaker would be that a user would make a request through the voice-activated device. The voice input will then be transferred to the cloud where the natural language processing will decode (Alanwar, Balaji, Tian, Yang, & Srivastava, 2017). After processing with the backend, it will reply in a text response, which will then go through the cloud and gets transformed into a voice response. The device will deliver the voice response back to the user (Alanwar et al, 2017; Terzopoulos & Satratzemi, 2020). Because smart speakers are always attentive, it is able to observe and collect information on their surroundings and users throughout the day. Smart speakers have been embraced by many around the world by all generations. This could mean that the target market for smart speakers would be individuals who are aged from 18 to 55 years old (Fritschele, 2019; Statista Research Department, 2020).

Digital users are more dependent on smart speakers as it becomes more present in homes (Business-Insider, 2018). The definition for smart speakers in this study are like Hwang's (2018) explanation; a speaker which are Wi-Fi connected with an inbuilt voice-activated system where the user is able to ask any question and the voice assistant would response using voice response. It can also be connected to other smart home appliances in the users' household. Smart speakers make life easier for users as it brings efficient and small improvements into their everyday lives (Partida, 2021). Some of the advantages would include convenience, savings, and be alert. Users are able to make calls, ask questions, schedule appointments, control lights, temperature, and locks with voice commands and without touching one's phone. The recent

improvements to the smart speakers allow users to save both time and money as well as be on alert for emergency situations (Partida, 2021). The more a user uses the smart speakers, the more it can understand the regular tasks, which saves time. In an emergency, the smart speaker can alert the user, which helps keeping the individuals safe from intruders (Partida, 2021). Although smart speakers are not able to call emergency services, users are able to set their own emergency contact where the virtual assistant can contact. These features are convenient for individuals with disabilities and the elderly (Smith, Sumner, Hedge & Powell, 2020; Cericola, 2021). It was reported that participants in those studies, find it less lonely and had someone to talk to when they are home alone. Participants also enjoyed the features because they felt better that they were able to do things themselves.

Based on Bentley, Luvogt, Silverman, Wirasinghe, White, and Lottridge (2018), the common uses of the smart speakers with music being the most used function among the smart speaker users in America. Similarly, Statista Research Department (2020b) surveyed 1,754 respondents that owns a smart speaker and saw that 'search for and play songs' is the highest uses of their smart speakers with 'set the alarm' and 'check the time' following behind. The survey also questioned the influencing factors for owning smart speakers in Malaysia. The highest influencing factor is respondents wanting to control their smart appliances remotely and the convenience of controlling their music without physically being on the device following behind (Statista Research Department (2020c). Even though the number of respondents does not represent the whole of Malaysia, it shows that there are early adopters of smart speakers. They are aware of the uses and benefits of using a smart speaker. This shows that there is a potential of increasing Malaysian consumers' intention to adopt a smart speaker.

1.2.2 Market Segmentation

Market segmentation is a strategic process which helps identify and better understand the target customer (Hunt & Arnett, 2004). For this study, the detailed market segmentation is categorized with market by devices, end-users, distribution channels, and geography.

1.2.2(a) Smart speaker market by devices

Voice powered digital assistance made its first debut into consumer mainstream with Apple's digital assistant, Siri, in 2011 (Smartsheet, 2020). Using Siri as an example, many companies have been evolving their own intelligent virtual assistant into their own smart speaker devices. Amazon's Alexa and Google's Google Assistant have been dominating the global smart speaker market while Apple's Siri and Xiaomi's Xiao AI are following behind.

In November 2014, Amazon was the very first company in the smart home market to introduce the Amazon Echo as the first smart speaker. Since then, the Echo series has been extended significantly which includes variations such as Echo Dot, Echo Show, Echo Spot, Echo Look, Echo Plus, and Echo Studio (Amazon, 2020a). Echo Dot (4th Gen) is the latest product from Amazon in 2020. It has two colours: twilight blue and glacier white. It has a sleek, ball-shaped sphere compact design with a crisp vocals and balanced bass sound (Amazon, 2020b). This new generation product comes with a clock which can help create timers and routines for the convenience of consumers. Echo Dot (4th gen) is a round shape with the size of 3.9" x 3.9" x 3.5" and a weight of 351.3g (Amazon, 2020b). It is compatible with Wi-fi networks and has a Bluetooth connectivity with a LED display. Amazon smart speakers are only compatible with Fire OS, Android, or iOS devices. Key privacy features that this

speaker offers would be wake word technology (Alexa), streaming indicators, microphone on/off button, the ability to view and delete voice recording, etc. (Amazon, 2020b).

All the Amazon smart speakers are operated with Alexa, Amazon's own voice assistant. Alexa is always ready to help and can be used for many different tasks. Playing music from different streaming platforms, retrieve any information from the internet, read the news, manage any smart home devices, set alarms, manage to-do lists, provide real time information, traffic and weather are some of the tasks Alexa can do (Lopez, Quesada, & Guerrero, 2018; Amazon, 2020b). Alexa can be paired with different smart home devices such as lights, TVs, locks, smart plugs, cameras, thermostats, or cloud-based services like Spotify or Prime Music (Purington, Taft, Sannon, Bazarova, & Taylor, 2017; Amazon, 2020b). Amazon released an extended external function called Skills where third-party developers can add to Alexa's voice-driven capabilities (Kim, 2018). Skills allows any developers or company to create their own Skills where Alexa can engage to multiply its functionality (Kim, 2018). Amazon stated that Alexa gets smarter as users continue using the smart speaker by adapting to the users' voice, search patterns and personal preferences (Kim, 2018). Some commands could be "Alexa, play music", "Alexa, set timer to 20 minutes", "Alexa, send a message", "Alexa, dim the lights in the living room", "Alexa, turn off the TV" (Amazon, 2020b).

In 2016, Google entered the smart speaker market with their very own smart speaker called Google Home. It was then upgraded to a more powerful and impressive version in 2017 called the Google Home Max. However, in 2019, Google merged with the Nest brand which rebranded their smart home brand to Google Nest (Gartenberg, 2019). Google wanted to make their home products helpful so that users' privacy is

always protected. With the merge, it will eliminate third-party devices to capture data and will only be secured by Nest's various products such as smoke detectors, cameras, smart thermostats, alarms, and other future products (Seifert, 2019). Like Amazon's Alexa, Google Assistant is the voice assistant for all Google Nest smart speakers. Google Assistant can stream and listen to media such as streaming music, news, podcasts, radio, audiobooks, set alarms, read news, play games, read the weather, control other compatible smart home devices, play music, and other features (Lopez et al., 2018; Google, 2020a).

Google Nest Audio is the recently released device from Google. Google Nest Audio has stronger performance, faster Assistant response, softer exterior and a balanced sound and soaring vocals than the other Google Nest products. It has a fashionable, fabric-swathed design with an upright rectangular shape with soft corners and rounded sides at a size of 6.89" x 4.89" x 3.07" with a weight of 1.2kg (Kozuch, 2020; Seifert, 2020). There are five different colours to Nest Audio which are charcoal, chalk, sand, sage, and sky (Google, 2020b). Google Nest Audio is able to listen to users' voice and perform a variety of tasks such as steaming music from different platforms, control smart home devices like thermostats and lights, act as a home communication hub, order food, and control the users' smart TV (Kozuch, 2020). Unlike other smart speakers, Nest Audio adjusts its tunes based on the type of media that is playing, such as music, podcasts, or audiobook. Like Amazon's Alexa, Nest Audio also have a physical switch at the back of the device to mute the microphones so users' voices will not be picked up by the Google Assistant. There are touch points on the top of the speaker. Users can tap the top centre to play or pause, tap the left to turn down the volume and tap right to turn up the volume (Google, 2020b).

In 2018, Apple entered the smart speaker market with Apple HomePod. Unlike Amazon and Google, Apple HomePod is more focused on having an advanced audio technology for users to experience incredible music listening (Apple, 2018). HomePod was designed specifically as a great sound quality speaker which then added the virtual assistant. Like other Apple products, Apple smart speakers are equipped with Siri as its voice assistant. Due to the different targeted market, HomePod is in the high-end speakers' market where users look for quality sounds (Apple, 2018). However, nowadays, Apple has added features where users are able to make and receive phone calls (Duprey, 2018; Apple, 2020a).

As of 2020, HomePod and HomePod mini is the only smart speakers Apple produced. Apple HomePod mini is the latest smart speaker that is released in 2020. The HomePod mini offer outstanding listening experience for music, AI, smart home capabilities, and built-in privacy and security (Apple, 2020a). HomePod mini has a better sound and offers comfort and convenience. It has a small spherical design with a fabric shell which can be blended nicely into the background. It has a height of 3.3 inches tall and 3.9 inches wide at a weight of 345g (Apple, 2020b). The smart speaker is available in white or space grey colour and can connect to different Apple products via Wi-Fi or Bluetooth. HomePod can play music only from Apple Music from other Apple devices, answer calls, suggest customized listening information, turn up the sound from Apple TV, and control Home-Kit compatible smart home devices (Apple, 2020b). With a single request to Siri by asking "What's my update?", users can know the latest news, weather, traffic, reminders and calendar appointments all by listening (Apple, 2020b).

Xiaomi corporation is a Chinese multinational electronics company. They first entered the smart speaker market in 2018 with Xiaomi's Mi Mix 2x and Mi Ai Speaker

Mini smart speaker (Shields, 2018). It has its own voice assistants like other smart speakers called Xiao AI, however, it only communicates in Mandarin to capture the Chinese market. Xiao AI can do standard voice assistant tasks such as set alarms and reminders, play and control music, take down notes, read the news, check the weather, control various compatible smart home devices, etc. (Shields, 2018). Xiaomi mainly focused on the Chinese market which means that it was not available worldwide. However, in 2020, it has launched a new smart speaker to capture the global market with an inbuilt Google Voice Assistant.

Xiaomi Mi Smart Speaker HD is the recent release from Xiaomi in 2020. It is a minimalist and discrete light grey cube or dark grey cube with a height of 23.4 cm and 5.9 inches square with a weight of 853g (Welsch, 2020). It can be connected through Bluetooth and Wi-Fi using compatible devices such as Android and iOS. At the top of the device, there are basic volume up and down, play and pause music with a LED ring that runs the entire circumference and lights up when it hears the users' voice. Xiaomi Mi Smart Speaker can be seen as the cheaper version of the Google Nest (Schwartz, 2020). It can do everything Google Nest is able to do and uses the Google Home app as well. Even though Xiaomi have produced many other smart speakers, this is the first smart speaker that is able to communicate in English. However, Xiaomi Mi Smart Speaker cannot be used in a business as they mainly focus on the streaming music and streaming videos on smart TVs (Schwartz, 2020).

1.2.2(b) Smart speaker market by end users

It is extremely important for a business to know their end users in order to know who would ultimately use the products or services (Yoon, 2020). According to Emergen Research (2020), the global smart speaker market is best segmented into

commercial and personal. Since this research is on smart speaker in home appliances, this will only focus on the personal end users. As shown in Emergen Research (2021), in terms of revenue contribution, the personal segment has a lead in contributing to the global smart speaker market when smart home devices were rising globally. Statista Research Department (2020a) saw that the smart speaker market revenue is expected to increase from US $19.6 billion in 2021 to US $35.5 billion in 2025, an estimated 81.12% increase in just four years. In comparison to the unit shipments, in 2020 alone had a 240.9-million-unit shipments worldwide and it is expected to increase to 409.4-million-unit shipments in 2025. According to the Smart Speaker Market report by Research and Markets (2018), some households are installing more than one smart speaker in their home, which eventually increases the revenues in the global market. In Canada, out of 1,0001 respondents, 57% owns only one, 27% owns two, and 16% owns three or more (Statista Research Department, 2021). Due to increasing products in multiple rooms, vendors can set up new innovative products in the market.

With the millions of unit shipments worldwide, Amazon, Google, Xiao, and Siri were amongst the smart speaker with intelligent personal assistant platform that contributed to the market share. As of 2020, Amazon still hold the dominant position in the smart speaker market. Based on Voicebot.ai's global smart speaker sales in Q1 2020, Amazon sales were 6.6% of the total global smart speaker sales. Due to COVID-19, sales were disrupted which impacted the smart speaker market to decrease (Kinsella, 2020). However, in the global smart speaker sales, Amazon still retained to be at the top. It was found that Amazon, Google, and Apple collectively captured 47% of the market share in Q1 2020 with Amazon capturing 23% of it (Kinsella, 2020). Based on the Voicebot.ai's global smart speaker sales in Q1 2020, Google sales were 5.5% of the total global smart speaker sales. Following behind Amazon, Google was

able to retain its top spot in the global smart speaker sales. Out of the 47% that was captured by Amazon, Google and Apple, Google was able to capture 19% of it (Kinsella, 2020). Even though Google is struggling to capture the market, it still has an impressive number of sales in the past couple of years. Apple and Xiaomi sales are both struggling to get a hold of the market. For Apple, it is due to its high price and limited features. Apple sales were only 1.4% of the total global smart speaker sales (Kinsella, 2020). With Amazon, Google and Apple capturing 47% of the market share, Apple was only able to capture 5% of it (Kinsella, 2020). Similarly, Xiaomi sales were only 3.2% of the total global speaker sales (Kinsella, 2020). Baidu, Alibaba, and Xiaomi were only able to capture 38% of the market share in Q1 in 2020 with Xiaomi only capturing 11% of it (Kinsella, 2020). The market share shows that there were some stabilities in the market even though there was an impact of the COVID-19 which hits China first before hitting the rest of the world.

The United States is the most popular country which adopted the smart speakers, and it continues to be the number one country in the smart speaker market. In 2019, Statista Research Department (2020) surveyed 4,272 respondents who owns a smart speaker in the US. It was revealed that 32% of the smart speaker owners in the US are between 18 – 29 years old with 30 – 49 years old following behind (28%). The lowest is aged between 50 – 64 and 65+ years old at 19%. This shows that those between the age 18 – 29 years old would most likely adopt smart speakers. Similarly in the UK, Statista Research Department (2020) revealed that out of 4,805 respondents, 28% are aged between 25 – 34 years old in 2020. 25% of the respondents are between 16 – 24 years old, and 13% are 55+ years old. Additionally, in South Korea in 2019, 27.41% out of 8,906 respondents are between the age of 35 – 44 years old. Those aged between 25 – 34 made up of 26.3% and those between 45 – 54 made up 24.66% of the

respondents. In Malaysia, out of 9,916 respondents, 21.16% who said they owns a smart speaker are between the age of 16 – 24 years old. 18.73% were 25 – 34 years old, 16.73% were between 35 – 44 years old, 12.52% were between 45 – 54 years old and 8.73% were 55 years and older owned a smart speaker in 2019. Based on all four countries mentioned, those between the age of 16 – 44 years old have own a smart speaker in 2019 and 2020. The statistics also showed that those who are 55+ years old also owns a smart speaker. This can be concluded that the demographic for the age group of those who owns smart speaker are between 16 – 55+ years old.

Another demographic information which can be collected through surveys are the gender of the respondents. In Great Britain, among 2,000 respondents in 2019, 16% were male while 12% were female (Statista Research Department, 2020). In that same year, among 4,405 respondents that owned a smart speaker in Singapore, 30% of them are male and 21% are female. Out of 8,905 respondents who owned a smart speaker in South Korea, 27.01% said they were male and 22.81% said they were female. Additionally, out of 9,916 respondents in Malaysia, 19% of the respondents are male who owned a smart speaker, while 17% of them are female. Out of the four countries, it can be seen that male owns smart speaker more than female did. The statistics shows that the percentage between male and female are very close to each other which indicated that female also enjoys owning a smart speaker. This can be concluded that the demographic for gender of those who owns smart speaker are both male and female.

The last demographic which can be collected through surveys are respondents' income level. According to Statista Research Department (2019), among 4,272 respondents, 34% of those with an annual income of US $75K+ said they owned a smart speaker. 24% of those with an annual income of US $30K - $75K owned a smart

speaker, and 15% of those with an annual income of under US $30K said they owned a smart speaker. In comparison, in a survey that was conducted in the US by Statista Research Department (2018), it was revealed that 27% of those with an annual income of US $100K+ said they owned an Amazon Echo device, 15% owned a Google Home and 18% owned other brands of smart speaker. For those with an annual income of US $50K - $100K, 20% said they owned Amazon Echo, 16% owned Google Home and 15% owned other brands of smart speaker. Lastly, those with an annual income of under US $50K, 12% said they owned Amazon Echo, 11% said they owned Google Home and 10% owned other brands of smart speaker. This shows that even if there is a gap of a year, there was an increase rate of those who adopted a smart speaker. It can be concluded that the demographic for income level of those who owns smart speaker are between less than US $50K – US $100K+.

It is important for a business to know who their end users are because it allows them to know the demographics of those who are using their products and services. This will help companies tailor their products and services to the intended end users and increasing the end user experience and support in order to increase their customer base. For the smart speaker market, the end user may appeal to men and woman who are aged between 16 – 55+ years old with an annual income between less than US $50K – US $100K+.

1.2.2(c) Smart speakers' market by distribution channels

Distribution channels looks at the path a company decides in order to deliver their products or services to consumers. In the smart speaker market, the distribution channels can be segmented into online and offline channels. With the development of the Internet and technology, it has impacted how businesses sell their products and

services without the need of a brick-and-mortar stores (Bucko, Kakalejčík & Ferencová, 2018). Electronic commerce (or e-commerce) has changed the way business and organizations worked. In the recent years, consumers have witnessed the rise of the online shopping industry, to the point where many would only buy products online (Bagla, 2017). According to Statista Research Department (2021), one of the leading reasons why consumers worldwide shop online is because of convenience of shopping any time of the day. Without a doubt, when smart speakers were introduced, it was available for purchase both online and offline. According to Global News Wire (2021), the consumer electronics e-commerce global market is expected to increase from $343.32 billion in 2021 to $511.06 billion in 2025 at a compound annual growth rate (CAGR) of 10%. There has been an increasing number of online original equipment manufacturer (OEM) e-commerce portals or online direct-to-consumers stores like Amazon, eBay, Best Buy, Alibaba, JD.com, Walmart, Target (Research and Markets, 2018). The online OEM have contributed to the growth of the e-commerce global market. The market is expected to rise due to the increased penetration of online shopping in consumers' lives.

According to Research and Markets (2018), another way the global smart speaker market is increasing in revenues are due to vendors. Leading vendors in the market are offering users how-to YouTube tutorial videos which helps beginners know the device and how to set up the smart speaker. Factors such as ease of accessibility, convenience, wide selection of products, and shopper reviews and content that is provided by the vendors had increased the online retail channels revenues in the global market. Due to the increasing popularity in online stores in the US, UK, Germany, and many other countries, it generates opportunities for the leading vendors and players in the global smart speaker market. Although online purchases via smart speakers is not

very successful, according to Hu (2018) and Perez (2020), many are using their smart speakers to shop. This means users are putting items in their digital shopping cart using smart speakers, however, they are not actually buying it. It is said that eMarketer predicts that US smart speaker users will increase sales via smart speakers by 15%, and for the UK users, 31.6%.

Even though online retail channels have increased in popularity, many users still prefer the traditional brick and mortar stores. Shops like Best Buy, Walmart, Target in the US are equipped with these smart speakers in order for those who preferred to buy instore. It was reported by Review Geek (2021) that Amazon might have a smart speaker product where it is more privacy focused. Smart speakers provide benefits and convenience through their integrated voice assistants, offering the users convenience and more efficient lifestyle (Lau, et al, 2018a), however, many are concerned about the security and privacy issues. Since smart speakers depends on the internet, it is hackable. Hackers can command the smart speaker to make a purchase and charge the users for the amount (Chu, 2019). Because of this, security is important to be considered extensively when smart speakers are being developed. In addition, privacy issues are another major concern. In order to increase functionality and resource efficiency, smart speakers constantly collect personal data (Chu, 2019). Because data collection has been innately programmed in the smart speakers, users have little to no control over the manner in which it is collected (Chu, 2019).

Most users have different mental models of smart speakers which leads to them having different perceptions of where all the data is being stored, processed, and shared (Abdi, Ramokapane, & Such, 2019). Users often have an inadequate understanding of which data their smart speakers make public, and which are kept private (Huang, Obada-Obieh & Beznosov, 2020). Majority did not know that their recordings were

being permanently stored and that they could review them and delete them (Malkin, Deatrick, Tong, Wijesekera, Engelman, & Wagner, 2019). Another issue of concern is the malfunction in the smart speakers such as smart speakers turning itself on for no reason. In March of 2019, several Amazon Echo owners reported similar stories where the device would turn themselves on in the middle of the night and start laughing for no reason (Chu, 2019).

The privacy focused Amazon smart speaker could be a device many consumers would want to purchase. Not only will it come more privacy-focused, but it can also operate offline too (Review Geek, 2021). As it can operate offline, it means voice commands are being sent back to the cloud for processing, which in terms of privacy, it is better. Amazon announced that when a user asks Alexa something, the system will process the command and the voice command will be deleted instead of being stored (Review Geek, 2021). Similarly, Sonos is working towards an offline voice assistant (Tech Radar, 2021). This can be an alternative for users who are concerned about their privacy and security, which can lead to the global smart speaker market to continue increasing in revenue.

1.2.2(d) Smart speakers' market by geography

The last segmentation for the global smart speaker market is geography. According to Research and Markets (2018), the market is segmented into four regions, Asia Pacific, Europe, North America, and rest of the world (ROW). It was reported that North America contributed the highest to the smart speaker market with a share of 36.9% (Kumar & Rasal, 2018). According to Statista Research Department (2020a), the US with €2,615 million has the highest spot in 2019 for the forecast of smart speaker market revenue worldwide, which Europe, and Asia Pacific following behind.

The US region have had high presence of advanced technologies with a high presence of key players which can be one of the major reasons why there is a significant growth in the region (Research and Markets, 2018). Rising trends of smart homes and presence of early adopters in the region can be other factors that contributes to the growth of the North American smart speaker market. The willingness of customers to adopt new technologies have been encouraging companies in the region to develop more innovative and cost-effective products (Emergen Research, 2021).

It was also reported that Asia Pacific shows the highest CAGR of 24.93% between 2018 – 2025 (Kumar & Rasal, 2018). Since there is an increased industrialization into the E-commerce industry, it can be anticipated that the region will soon have a high growth which will impact the smart speaker market. Countries such as China, India, Japan, and South Korea have been forecasted by Emergen Research (2021) to have a rising penetration of smart speakers. Not only are Amazon, Google, Apple, and Xiaomi predicted to increase sales in Asia Pacific, domestic players such as Baidu, Alibaba, Sony Corporation, Lenovo Group Ltd., SK Telecom Co., and Onkyo Corporation are expected to increase the growth of the smart speaker market in this region (Emergen Research, 2021). According to Statista Research Department (2020a), the most owned smart speaker brand worldwide in 2020 was Amazon Echo in Germany. The UK, USA, India, and Brazil also had Amazon Echo as the most owned smart speaker brand in its respective countries. For Netherlands, Canada, and Sweden, the most owned smart speaker brand is Google Home. For South Korea, it is KT GIGA Genie and for China, it is Huawei AI as their most owned smart speaker brand. It is no surprise Amazon is the market leader in the smart speaker market because in 2021, it was forecasted that the unit shipments worldwide were US $42.5 millions (Statista Research Department, 2020a).

According to Market Watch (2021), the smart speaker market was significantly impacted when COVID-19 outbreak hit worldwide. North America, Asia Pacific, the Middle East, Europe and South America are some of the markets which was impacted. As mentioned in section 1.2.2(b), the market's revenue was impacted due to COVID-19 outbreak. However, according to Tech Crunch (2020), the US smart speaker owners reported that they listen more to news and information through their device. Since many had to work from home during the outbreak, many have changed their behaviours while using the device. 36% of consumers say they increased their music and entertainment consumption during the outbreak, while 50% said they increase in news and information (Tech Crunch, 2020). It was also reported that quarantined adults helped increased the sales of smart speakers due to the value of having more than one smart speakers in their homes. With the advancement of technology and innovation towards the smart speakers, it is forecasted that more consumers worldwide will adopt smart speakers in the next couple of years.

1.3 Statement of research problem

The potential of smart speaker is limitless as they gain access to manage users' home devices (Hwang, 2018). This assumption is portrayed in the market value of smart speakers. As mentioned above, the smart speakers' market has been rising, which can be concluded that many consumers all over the world are constantly adopting smart speakers. The global market of smart speakers is valued at US $19.6 billion in 2021 and is expected to increase to US $35.5 billion in 2025 at a growing rate of 81.12% (Statista Research Department, 2020). The number of individual consumers using smart speakers are expected to increase from 240.9-million-unit shipment in 2020 to 409.4-million-unit shipment in 2025.

Bunyard (2019) stated that the main reason people adopt smart things would be the convenience the technology offers because users can be stress free and do not have to deal with things that takes time. A study by Purington et al (2017) about the degree of personification, sociability level of interactions, and user satisfaction of Amazon Echo devices found that there exists a variation for how consumers refer to technology, with over half using the name "Alexa". It was reported that users would interact with the device for entertainment purposes such as shopping, listening to music, manage schedules, and retrieve information. Individual's needs may vary based on characteristics. According to McLean and Osei-Frimpong (2019), the three needs include utilitarian, hedonic, and symbolic benefits. In terms of smart speakers, utilitarian benefits would be when an individual may use the smart speaker to gather information about a topic or complete a task. Hedonic benefits look at individuals using features to provide entertainment or enjoyment. And lastly, for symbolic benefits, individual would want to "reaffirm their social status", such as wanting to look more technology savvy through using the smart speaker (McLean and Osei-Frimpong, 2019). Some insights were provided looking at which variables would motive in-home use of voice assistant and it was found that voice assistant is mainly used for utilitarian purposes where it helps users to find information, complete tasks of the day, seek support and process orders. From the benefits that smart speakers offer, through cognitive, utilitarian, hedonic and social benefits, Budd (2020) concluded the psychological needs and desires are satisfied using smart speakers. However, Pal, Arpnikanondt, Funilkul, and Chutimaskul (2020) concluded that the hedonic aspects outweigh the utilitarian value. It was said that from other research, if the hedonic values outweigh the utilitarian values, it suggests that the technology is still in its early stages, and it is being used by early adopters mostly. In other research

regarding online shopping, it was concluded that the utilitarian value is a stronger predictor than the hedonic value (Overby & Lee, 2006). Rzepka (2019) examined the benefits and costs the users assesses when they use voice assistants. It was concluded that efficiency, convenience, ease of use, minimal cognitive effort and enjoyment are the fundamental objectives which maximises users' overall value when using voice assistants. Since voice assistants can be activated through voice, users do not have to think about syntax or grammatical errors as opposed to using text as input.

Beirl, Yuill and Rogers (2019) investigated how families learn and fit it into their lives regarding the new Alexa's skills such as music, storytelling, and games. The results showed that users were enthusiastic about how they interact with Alexa and how it became part of their family lives. Kowalski, Jaskulska, Skorupska, Abramczuk, Biele, Kopeć, and Marasek (2019) investigated the usage of voice assistants by older adults and found that participants were impressed with the range of possibilities of voice assistants. Participants liked that they are able to accomplish tasks using only speech. Pradhan, Mehta, and Findlater (2018) found that almost 38% of the reviews mentioned disabilities such as those who are visually impaired and suggested that voice assistants would be useful by this community. Abdolrahmani, Kuber, and Branham (2018) also confirmed that voice interaction is advantageous for the visually impaired because it will help make their day-to-day tasks easier. In the nearest future, more users will take advantage of the convenience that smart speakers provide which will lead to the market being expected to grow rapidly (Hwang, 2018). According to Statista Research Department 2020), among 1,754 Malaysian respondents, their top reason for owning smart speakers would be wanting their device to control their smart appliances remotely (58%). The second reason is controlling the music player (51%), with wanting to keep up with latest technology trends (29%) as their third reason. With

just these three reasons, the first reason is a utilitarian benefit, while the second is a hedonic benefit, and symbolic benefit for the third reason. Considering what McLean and Osei-Frimpong (2019), Budd (2020), Pal et al. (2020) have concluded, these psychological needs will need to be satisfied before and when owing technology. Therefore, this study recognizes that utilitarian benefits are more important than hedonic and symbolic benefit. This study believes that since developers are constantly developing smart speakers, users will gain more utilitarian benefits.

Even though usage of smart speakers in many countries are increasing over the period, the usage in Malaysia is still low. Statista Research Department (2019) reported that a survey has been conducted by Rakuten Insights from December 15 to 30, 2019, to find out respondents' intention to purchase smart speakers in the next 6 months. A total of 6,228 respondents answered the online survey of which 3,570 were female and 2,658 were male age 16 years and above. The result revealed that about 63% of the total respondents stated that they did not own smart speakers. In the same survey, 19% of Malaysian respondents who did not own smart speakers stated that they intended to purchase one while 30% did not know if they will buy one. To the mass majority of the Malaysian consumers, the exposure of smart speakers is still in its infancy, even if early adopters are familiar with smart speakers (Chu, 2019).

As mentioned before, the usage of smart speakers is predicted to increase significantly in the coming years all over the world. With the increase of technologies, there has been a new trend which creates a competitive company in the economy development, digital economy. Digital economy is an economic activity that is related to the development of digital technologies, such as online services, electronic payments, e-commerce, and crowdfunding (Borremans, Zaychenko & Iliashenko, 2018). In other words, it includes goods and services that are processed using digital

technologies. Digital economy has been the driver of the economic growth and social change. According to Brookings (2019), the digital economy's worth in 2018 is around US $11.5 trillion globally. It was reported by Brookings (2019) and Bukht and Heeks (2017) that ICT industry and ICT-enabled industries have made an important contributions and impact on the digital economy. Embedding connected sensors into more objects such as IoT, new end-user devices such as mobile phones, smartphones, etc, new digital models such as cloud computing, digital platforms and service, growth of big data, data analytics, and new automation are some of the examples of ICTs. According to Business-Wire (2020), the forecast spending on ICT in 2020 will be US $4.3 trillion. IDC (2017) mentioned that due to the rapid growth of IoT and other industries, the new technologies will soon increase the annual revenue. IoT, AR/VS, AI, robotics, and 3D printing are the new ICT markets IDC (2017) are predicting that will impact the economy. As mentioned above, smart speakers are a part of the ICT assets, more specifically under IoT, it has been contributing its revenue to the economy. Since there are now many investments in new technologies and ICT infrastructure, it is no surprise that smart speakers will continue contributing immensely to the digital economy.

According to Statista Research Department (2021), the highest global ICT market share in 2021 is the US region with over 34%. EU and China are ranked second and third with 15% and 11% respectively. Additionally, the rest of the world (excluding US, EU, China, Japan, and India) have a market share of 30.6%. This does not accurately represent the market share for Malaysia, however it can be seen that it is a small amount. Based on International Trade Administration (2021), the forecasted ICT spending in Malaysia will be $25.2 billion in 2021. The five leading sectors are manufacturing, constructions, energy, travel and leisure, and BFSI (International

Trade Administration, 2021). This shows that cloud computing or IoT are not identified as important sectors for Malaysia. However, the report stated that cloud computing, IoT, and big data analytics are major challenge for Malaysia due to the lack of understanding of the IoT ecosystem. Malaysia aims to tackle the issue and try to enable IoT as a new source of growth for the national economy. This is the first step for Malaysia to implement the latest technology, however, the adoption of smart speakers is still low.

Statista Research Department (2020) also showed that only 0.2 million smart appliances are active in households in Malaysia. As of 2019, Malaysia's population was about 32.60 million people (Trading Economics, 2019). This shows that majority of the Malaysian population have yet to adopt the smart speakers. There could be various reasons as to why they have not adopted it, however, it is predicted that the statistics will increase in the future. Because the user base in Malaysia for smart speakers is rather small, the study of intention to adopt will provide the necessary foundation for later studies on consumer behaviour. The gap that this research address would be to understand why Malaysian consumers' have not yet adopted the smart speakers.

Determining the independent variables, dependent variables, mediator and/or moderator are important as this will determine which variables are useful to achieve the goal in understanding why Malaysian consumers' have not yet adopted smart speakers. In terms of smart speaker, intention can be an indicator which evaluates how people are willing to access to a certain behaviour and effort to perform it (Ajzen, 1985). Regarding adoption intention, it can be defined as an individual's desire to buy an item (Reza, Sembada, Miliani, & Resti, 2014). According to Blackwell, Miniard and Engel (2001) what crosses in the customer's mind signifies intention to purchase