Global Business and Management Research: An International Journal
Vol. 14, No. 3s (2022)

Mediating Influence of Attitude on Factors Influencing Malaysian Consumers' Intention to Adopt a Smart Speaker

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Abstract
Purpose: This study provides insights into Malaysian consumers' attitudes toward intention to adopt smart speakers and evaluates adoption intention's impact as a mediator in the relationship between factors on intention to adopt.
Design/Methodology/Approach: The variables were evaluated on a 5-point Likert scale with the option: 1) Strongly disagree, 2) Somewhat disagree, 3) Neither disagree or agree, 4) Somewhat agree and 5) Strongly agree. These scales were derived from Schudzich (2019) and were adapted to the context of the study. In total, 202 questionnaires were collected.
Findings: The main objective of the study is to examine if there is a relationship between the independent variables (PU, PEOU, security, and price), mediator (attitude) and dependent variables (intention to adopt). The results show, attitude mediates the relationship between factors and intention to adopt. However, gender and age does not moderate attitude. All hypotheses were accepted except H8 and H9
Research limitations/implications: The current study only measured five different factors against intention to adopt in Malaysia. Furthermore, the price of Smart Speaker maybe too high for majority of Malaysian consumers.
Practical implications: Implementation of Smart Speaker system consistent with the technological advancement in current marketplace. Even though the price is not cheap, but practically, many can benefit from the system.
Originality/value: This study has extended the literatures in linking the relationship between attitude, factors, and intention to adopt. Furthermore, no studies conducted yet in Malaysian perspectives.

Keywords: smart speakers, TAM, intention to adopt, perceived usefulness, perceived ease of use, security, price, attitude

Introduction

Over the last few decades, the development of networks, computing power, and wireless technologies has emerged a new paradigm called the Internet of Things (IoT). The Internet of Things entails the incorporation of tags, sensors, and actuators into items that are connected via an open standard Internet protocol (Crowley & Coutaz, 2015). Household devices have changed from ordinary physical objects into physical objects that can carry information and

become information and communication technologies (Dutton et al, 2014). Wireless sensor technology enabled items to transmit data about their surroundings, context, and location (Ng & Wakenshaw, 2017). Many home-based internet-enabled devices are now part of the Internet of Things (Crabtree & Tolmie, 2016; Jara et al, 2014; Yun et al, 2015; Li et al, 2012). According to Kannan (2017), the Internet of Things will impact people's lives in the future. The Internet of Things allows users to monitor and operate internet-enabled household equipment via smartphone applications. To qualify as an Internet of Things object or device, it must have been able to connect to the internet and transmit information via internet transfer protocols (Wilkinson, 2020). It is believed that IoT can have a wide range of benefits in IoT applications like smart homes, healthcare, transportation and environment. Internet of Things services have increased many products which can be connected through a network including smart speakers.

Hwang (2018) defined smart speakers as speakers which are Wi-Fi connected with an inbuilt voice-activated system. Smart speakers, the same as smart phones, are Bluetooth and WIFI equipped device containing installed voice assistant functionality. Smart speakers integrate with microphones which allow the user to activate and can provide orders to the voice assistant. (Gautier & Gestanes, 2016). Due to the microphones, smart speakers are always listening, however, it will only be activated to listen when their pre-selected call word or 'wake word' is used. According to Alanwar et al (2017), When the device is turned on, it uses beamforming to boost auditory sensitivity in the direction of the person speaking. The voice input is subsequently transferred to the cloud, where it is processed using natural language. The user receives the processed information and appropriate answer as an audio response. Because of their always-listening nature, smart speakers are able to monitor and collect information on their surroundings and users throughout the day. Amazon has been dominating the smart speakers' industry with Google, Apple, Samsung, and Xiaomi following behind (Park et al, 2018). Smart speakers are set to be the next big technological development in the technology industry.

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. The global market of smart speakers is valued at $2.68 billion in 2018 and is expected to reach $11.79 billion in 2023, growing at a rate of 34.44% (Hwang, 2018). The number of individual consumers using smart speakers is predicted to increase from 390 million to 1.8 billion worldwide from 2015 to 2021 (Budzinski, et al, 2018). Even though the usage of smart speakers is increasing over the period, the usage in Malaysia is still low with only 19% of Malaysian respondents stated that they will intend to purchase smart speaker (Statista Research Department, 2019). Statista Research Department (2020) also showed that only 0.2 million smart appliances are active in households in Malaysia. Even early adopters are well-versed in smart speakers, the majority of Malaysian customers are unaware of them. Given the modest number of smart speaker users in Malaysia, the study of intent to adopt serves as a critical foundation for future consumer behaviour research. The gap that this research address would be to understand why Malaysian consumers' have not yet adopted the smart speakers. Therefore, to fill the research gap and to assist companies in understanding users' adoption intention, this study aimed to investigate consumers' attitudes toward smart speakers and their determinants by surveying consumers in Malaysia. This study contributes attitude in the conceptual framework in order to test why there is a relation between the factors and intention to adopt in Malaysia. Therefore, this research seeks to fill in the gaps left by previous findings on the connection between factors, attitude, and intention to adopt.

This study is significant to identify whether the factors for the intention to use that apply in other countries also apply to Malaysia. If the result is the same, then we can imply that

Malaysian consumers are doing what other consumers worldwide are doing. If, however, the result is otherwise, then further analysis will have to be made in order to understand the reasons for the difference. This research also contributes to understand the IoT adoption by using the TAM and security and price. In addition, given the rapid growth of IoT technology and smart home applications, the findings from the study will provide a platform that will provide benefits for regulators, practitioners, academicians, and the public at large to have a greater understanding of the driving forces in the market for smart speakers in Malaysia. From a practical perspective, Smart speakers are still new, and consumers lack the basic IoT knowledge or skills. Consumers might feel like it is difficult to use, thus, they might not use the product. As a result, understanding customer adoption behaviour will enable businesses to improve consumer procedures while also increasing revenue opportunities. This research also informs related industry and practitioners on the smart speaker usage pattern in Malaysia. The study's findings will be useful to service providers, business model developers, and marketing practitioners in developing promotional methods to influence favourable and impactful customer decision-making toward their products and services.
The remainder of this work is organised as follows to answer the research questions indicated above. The literature review and conceptual development of the suggested model, as well as the study's hypotheses, are discussed in the next section. The approach is presented in the third section, and the findings are presented in the fourth section. The findings of the empirical study are reviewed in the final section, along with practical consequences and recommendations for further research.

Literature Review and Hypotheses Development

This study's model depicts the determinants, mediators, and moderators that influence users' intentions to utilise smart speakers in Malaysia. To enrich TAM, the model took TAM as the foundation and added two new aspects (security and pricing). The four independent variables are shown in the model as predictors of customers' attitudes (mediating variables) toward the dependent variables (intention to adopt). The consequences of mediation differ between people who have a positive mindset and those who have a negative attitude. PU and intention to adopt, PEOU and intention to adopt, security and intention to adopt, and price and intention to adopt are only a few of the interactions where attitude (mediating variable) plays a role. In this study, PU refers to customers' perceptions of their own performance, enhanced when they are using smart speakers while PEOU refers to consumers' feeling that smart speakers are easy to use and control. According to Davis (1989), the intention to adopt a new technology determined by the attitude towards the technology and PU, while attitude can be influenced by PU and PEOU. For new product adoption intentions, attitude mediates the effect of PU and PEOU. The mediation effects are different from those with positive attitude and those with negative attitude. Vahdat et al (2020) stated one mediating factor that can be considered a replication of TAM would be attitude towards mobile app use. Amoroso and Ackaradejruangsri (2017) concluded that there is a link between PEOU and satisfaction which is moderated by customer attitude. Rivera et al (2015) also concluded that the mediation of attitude can affect the technology experience on usage intention.

The affect-behaviour-cognition model by Hsu and Lin (2016) confirmed that there is an attitudinal effect. Essentially, it was suggested that stickiness is affected by the users' attitude and how it mediates the beliefs about perceived value (e.g., hedonic and utilitarian values) (Vahdat et al, 2020). Consumers have a good attitude about mobile banking, according to Akturan and Tezcan (2012), when they believe technology will help them complete their activities relatively more efficient, make it a lot easier to perform out their banking-related

tasks, and be beneficial overall. Gao and Huang (2019) examined which factors would have an association with smart TV or AI-powered Smart TV. Due to the rise of smart service, it allowed platforms like AI TV to have a smart content service. They used the TAM model to predict if PEOU and PU of an AI TV service has a positive direct effect on attitude towards behaviour as well as if attitude towards behaviour of AI TV service has a positive effect on intention to purchase. It can be concluded that PEOU and PU significantly affects intention to purchase through attitude.
Conclusions from previous studies confirm that attitude mediates the effect of PU and PEOU. As such, if consumers perceive that their performance is enhanced when using smart speaker and smart speaker is easy to use and control, it will have a positive influence on their attitude towards smart speakers. Therefore, the following hypotheses are proposed for this study:

H1: Perceived usefulness (PU) of smart speakers has a positive influence on attitude.
H2: Perceived ease of use (PEOU) of smart speakers has a positive influence on attitude.

Smart speakers are equipped with an active microphone that captures all requests and delivers them to a server, which analyses and provides customers with the information they requested. Personal information, such as bank account numbers, is retained on the device. As a result, there are two risks: data security issues and the fear of being watched or spied on. Previous research, particularly in the areas of online commerce (Tong, 2010), online banking (Lee, 2009), and smart home services (Yang et al, 2017), has found that security and privacy issues are key concerns in affecting attitudes or behavioural intentions to use. Some academics see privacy and security problems as "two obviously distinct notions" (Belanger et al, 2002), whereas others disagree (Fang et al, 2008; Grewal et al, 2004; Zhang & von Dran, 2000).
Grabner-Krautner & Kaluscha (2003) and Urban et al, (2003) argue that privacy and security concerns related with online purchase fit into both uncertainty camps in that privacy and security "mistakes" might occur from both exogenous (e.g. hackers) and endogenous (e.g. in-house abuse of data) acts. Furthermore, most internet buyers can't tell the difference between security and privacy, and they often confuse the two. As a result, security and privacy concerns are treated as a single construct in this study. Security is described as a threat to data that has the ability to inflict financial hardship, denial of service, fraud, waste, and misuse (Kalakota & Whinston, 1997). As a result, if customers think that their security concerns are being addressed, their attitude toward smart speakers will improve. Relationship integrity, confidentiality, authentication, and non-recognition were all examined in terms of security. Thus, the following hypothesis is proposed:

H3: The level of security of smart speakers has a positive influence on attitude.

Price refers to the actual market price of the product and the participants' thought of that (Hoffman & Thuesen, 2018). Rankin et al (2018) found that price is an important factor which drives consumer attitude to use product or service because the consumers' overall assessment of the utility of a product is based on the perception of what is received and what is given. Ranaweera and Karjoluoto (2017) stated attitude is related to price and So et al (2018) showed price was a strong predictor of consumers' attitudes towards Airbnb. Research also found that if consumers need to pay a higher price for a product or service, it refrains consumers from paying for a product or service they are not familiar with (Andersson & Heinonen, 2002). In order for the price to have a positive influence on intention to adopt, the benefits of using specific technology should be perceived greater than the monetary cost (Venkatesh et al, 2012).

Wong et al (2020) found that price is significant in affecting mobile Internet adoption intention on the use of mobile internet in Malaysia. It can significantly impact consumers' attitude towards technology if the cost and price is set too high which can lead to unwillingness to adopt. Shin (2009) stated that when using the smart speakers, if the perception of price has a greater benefit compared to monetary cost, consumers' attitudes will be positive and would likely adopt smart speakers. Ashfaq et al (2020) stated that price is an important factor which drives consumers' attitude to use the product or service. In the context of smart speakers, Ashfaq et al (2020) predicted that towards smart speakers, price will be a stronger predictor of consumers' attitudes. Price is an important factor for any end user of a technological product and that price is influencing the level of expectation that people have towards smart speakers and its performance (Hoffman & Thuesen, 2018). Price include the device and data costs, or other types of service charges. Thus, the following hypothesis is proposed:

H4: Price of a smart speaker has a positive influence on attitude.

Fishbein and Ajzen's Theory of Reasoned Action (TRA) (1975) was used to explain behavioural intentions in many behavioural studies (Karahanna et al, 2006). Theory of planned behaviour (TPB) is the extension of TRA. In many information technologies, TRA has been said to be effective in determining and understanding people's behavior (Ajzen, 2002, 1991). TPB claims that a person's actual behaviour when completing certain acts is affected by their perceived behavioural control, as well as their attitude, subjective norms, and perceived behavioural controls. The willingness to put forth effort when engaging in certain behaviours is known as behavioural intention (Ajzen, 2002). The term "attitude" refers to a person's positive or negative assessment of a given behaviour. Luna et al. (2017) discovered that attitude had a positive impact on the intention to utilise NFC payments in Brazil. According to the study's findings, attitude is the strongest factor and has a significant and positive impact on using intention. Research conducted by Chen and Adams (2005), Meharia (2012), and Schierz et al (2010) found that a person's attitude about technology use affects their intention to utilise it. According to Lee (2009), attitude has a substantial impact on a consumer's intention to use internet banking and is the second positive determinant. Because smart speakers are already in their initial phases of development, it's critical to understand how customers feel about their willingness to adopt them. An attitude can either be positive or negative, and previous researchers proved that since attitude influence intention to adopt, companies and marketers would need to ensure that consumers have a positive attitude towards the products in order for it to be successful. As such, consumers' intentions to embrace smart speakers will be positively influenced if they have a positive attitude toward utilising smart speakers. Therefore, the following hypothesis is proposed:

H5: The intention to adopt smart speakers is positively influenced by one's attitude toward them.

Previous research saw that the determinants like PU and PEOU influence behavioural intention through attitude. Therefore, this study suggest that attitude mediates the relation in a variety of interactions, including PU and adoption intention, and PEOU and adoption intention. Furthermore, this research suggests that attitude plays a mediating function in a number of interactions, including security and adoption intent and price and adoption intent. The reason behind this would be that when customers value smart speakers favourably, there would be less concern on security and price, and it could improve attitude on intention to use. Thus, the following hypothesis is proposed:

H6: Attitudes towards smart speaker mediates the relationship between perceived usefulness and intention to adopt.
H7: Attitudes towards smart speaker mediates the relationship between perceived ease of use and intention to adopt.
H8: Attitudes towards smart speaker mediates the relationship between security and intention to adopt.
H9: Attitudes towards smart speaker mediates the relationship between price and intention to adopt.

In addition to IV, DV and mediating variable, the moderating variables are predicted to have moderating effects on the different constructs. This study identifies two moderating variables: gender and age. Gender has been considered as a moderating effect in many TAM research. Previous studies such as Wynn (2009), Karjaluoto et al (2010), Vahdat et al (2020) have analysed gender as a moderating affect. Therefore, this study propose that gender moderates the effect on attitude towards smart speakers. This is due to the reasoning that gender plays a role when it comes to the PU and PEOU of a consumer. Women perceives things differently than men, and their willingness to try new technologies are also different. Therefore, the following hypothesis is proposed:

H10: Gender moderates the effect of attitude towards intention to adopt smart speakers.

Based on previous studies, the effect of age moderation is different in each study. According to Chu (2019), the moderation between age and IoT skills and self-innovativeness are weak which means that it does not have any significant influence on the main variable. However, Park et al (2018) concluded that age significantly influence intention to adopt. This could be because since smart speakers' functions are more favourable towards family, the higher age group would be the ones who would adopt the smart speaker. Vahdat et al (2020) also concluded that the mediating role of age between PU and attitude towards mobile apps use was only significant with the younger groups. Therefore, this study propose that age moderates the effect on attitude towards smart speakers. The reason behind this would be because the younger groups are more aware of the recent technologies and would know how to use. Thus, the following hypothesis is proposed:

H11: Age moderates the effect of attitude towards intention to adopt smart speakers

Methods and Findings

To achieve the research objectives and answer the research questions, this study uses descriptive research. The data collected through an online survey. The goal of the research is to find out what participants think about smart speakers and how they plan to use them in Malaysia. Although most consumers have never encountered the Malaysian market or technology, the devices' capabilities and operations are likely unknown to potential adopters. As such, the online survey starts with an introduction to different types of smart speakers available in Malaysia, its key features and functions and its price.
The independent variables were evaluated on a 5-point Likert scale with the option: 1) Strongly disagree, 2) Somewhat disagree, 3) Neither disagree or agree, 4) Somewhat agree and 5) Strongly agree. These scales were derived from Schudzich (2019) and were adapted to the context of the study. In total, the participants were asked to provide respond for 23 statements

of dependent and independent variables. Table 1 provide a summary of the key construct and measurement items.

Table 1 Summary of Key Construct and Measurement Items

Construct	Number of Items	Scale	Sources
Perceived usefulness	4	5 points	Adapted from Chu (2019)
Perceived ease of use	4	5 points	Adapted from Thompson et al (2005), Nysveen et al (2005) & Pal et al (2020)
Security	4	5 points	Adopted from Chu (2019)
Price	4	5 points	Adopted from Chu (2019)
Attitude	4	5 points	Adopted from Chu (2019)
Intention to adopt	3	5 points	Adopted from Chu (2019)
Total	23		

Overall, there were a total of 202 respondents who completed the survey. However, only 200 were usable for data analysis. This study yielded a response rate of 99%. The remaining two questionnaires were rejected due to an incomplete respond which were removed from the final sample. Table 2 summarized the demographic profile of the respondents.

Table 2 Demographic Profile

Measure	Items	Frequency	Percent
Gender	Male	70	35
	Female	130	65
Age	Between 18 years	5	2.5
	Between 19 – 22 years old	28	14
	Between 23 – 29 years old	119	59.5
	Between 30 – 40 years old	16	8
	Between 41 – 50 years old	16	8
	Between 51 – 60 years old	13	6.5
	More than 60 years old	3	1.5
	Total	200	100.0

According to Abdul Wahab et al (2011), it is important to do data screening for quantitative research. Data screening will help the researcher to identify any data errors and missing values and also ensures that only valid and reliable results are being used. For this study, the descriptive statistics was used for data screening. The descriptive statistics looks at the minimum and maximum, mean, and standard deviation. Table 3 shows the descriptive statistics and mean score level.

Table 3 Descriptive Statistics and Mean Level Score

	N	Minimum	Maximum	Mean	Std. Deviation	Level
PU	200	1.00	5.00	3.68	.622	High
PEOU	200	1.25	5.00	3.87	.712	High
Security	200	1.00	5.00	3.06	.907	Medium
Price	200	1.00	5.00	3.45	.979	Medium
Intention to adopt	200	1.00	5.00	3.65	.885	Medium

Attitude	200	1.00	5.00	3.89	.842	High
Valid N (listwise)	200					

The reliability analysis was tested using the Cronbach's alpha. The varimax rotated component matrix in factor analysis was used to verify convergent and discriminant validity during measurement validation. Cronbach's alpha values ranged from 0.508 to 0.935, according to the findings. Although the PU value was less than 0.6, it was considered meaningful for this study due to flaws in social science research. If the composite reliability (CR) is 0.7 or higher and the average variance extracted (AVE) is 0.5 or higher, convergent validity can be proven, according to Chu (2019). The CR values for all constructs are higher than the criterion 0.7 and the AVE values for all constructs are also higher than the criterion 0.5 as presented in Table 4. According to Fornell & Larcker (1981), the result established convergent validity. Every factor is larger than the coefficient of correlation between the relevant component and other factors due to the square root of the AVE, indicating discriminant validity in the measurement model.

Table 4 Reliability Analysis

	Number of Items	Cronbach's alpha (a)	Composite reliability (CR)	Average variance extracted (AVE)
PU	4	0.508	2.618	0.600
PEOU	4	0.720	2.921	0.520
Security	4	0.897	2.204	0.699
Price	4	0.927	1.788	0.803
Attitude	4	0.935	2.463	0.634
Intention to adopt	3	0.763	2.30	0.568

The correlation result revealed a positive significant correlation at 1% or lower significant level between PEOU and PU (0.594), PEOU and security (0.341), PEOU and attitude (0.517), PEOU and intention (0.264). In addition, a positive significant result is also between PU and security (0.353), PU and intention (0.401) and PU and attitude (0.624). The other positive significant correlation is between security and price (0.140), security and intention (0.264) and security and attitude (0.450). The significant correlation between variables is between 25% to 62%. Basically, the results of Pearson correlation coefficient for the whole sample are quite low. The highest significant correlation between variables is about 62%. To confirm Pearson correlation result, a bootstrap analysis was performed. The BCa result of lower and upper level should be on the same sign in order to show statistically significant correlation. As such, the result from BCa confirmed Pearson correlation result of no statistically significant result between gender and other variables (age, PU, PEOU, security, price, intention, and attitude) and between age and other variables (gender, PU, PEOU, security, and intention) and between price and other variables (gender, PU, PEOU, security, and intention). Table 5 summarize the correlation result.

In order to find the relationship between the independent variables, moderator, mediator and dependent variable, this study used ordinary least regression analysis. Before performing the OLS regression analysis, it is important to make sure that the data passes the assumptions needed in order for it to be valid. According to Ernst and Albers (2017), there are four main assumptions which are linearity, homoscedasticity, normality, and independence of error terms as well as outliers and multicollinearity. This study performed all the test suggested by Ernst and Albers (2017) and the result showed that there was no violation, which means that the regression analysis to test the model can be conducted.

Table 5 Correlation Analysis

		GENDER	AGE	PU	PEOU	SECURITY	PRICE	ATT	INTENT
GENDER	Pearson Correlation	1							
AGE	Pearson Correlation	-.077	1						
PU	Pearson Correlation	.012	-.086	1					
PEOU	Pearson Correlation	.005	-.142*	.594**	1				
SECURITY	Pearson Correlation	.015	-.040	.353**	.341**	1			
PRICE	Pearson Correlation	.072	-.294**	.072	.073	.140*	1		
ATT	Pearson Correlation	-.048	-.085	.624**	.517**	.450**	.251**	1	
INTENT	Pearson Correlation	-.106	.057	.401**	.376**	.264**	.036	.619**	1
*. Correlation is significant at the 0.05 level (2-tailed).									
**. Correlation is significant at the 0.01 level (2-tailed).									

For this study, a four-step regression method and significant of the coefficient is examined at each step. Four models were created; Model 1 which include the factors and intention to adopt, Model 2 includes the factors and mediator, Model 3 includes the mediator construct and the DV and Model 4 include factors, mediator, and intention to adopt. The overall regression on model 1 is significant, as shown by the F-statistic of 12.264 ($p = 0.000$). The model has a moderate fit of 12% in explaining the dependent variables. The adjusted R square is 0.185 which indicates the variance of intention to adopt can be explained for 19% by perceived usefulness, perceived ease of use, security, and price. The detailed result of each factors reveals that PU ($\beta = 0.25$, $p < .01$), PEOU ($\beta = 0.19$, $p < .01$), were found to be significant and have a positive relationship with intention to adopt. However, security ($\beta = 0.11$, $p > .01$) and price ($\beta = -0.01$, $p > .01$) was found to be insignificant. The overall regression on model 2 is significant, as shown by the F-statistic of 48.965 ($p = 0.000$). The model has a moderate fit of 49% in explaining the dependent variables. The adjusted R square is 0.501 indicate the variance of attitude can be explained for 50% by perceived usefulness, perceived ease of use, security and price.The detailed result of each factors reveal that PU ($\beta = 0.43$, $p < .01$), PEOU ($\beta = 0.18$, $p < .01$), security ($\beta = 0.21$, $p < .05$), and price ($\beta = 0.17$, $p > .01$) were found to be significant and have a positive relationship with attitude.

The result for model 3 reveals that the overall regression on the model is significant, as shown by the F-statistic of 96.899 ($p = 0.000$). The model has a highest fit of 97% in explaining the dependent variables. The adjusted R square is 0.33 indicate the variance of intention to adopt can be explained for 33% by attitude. The result shows that attitude has a positive significant relationship to intention to adopt ($\beta = 0.57$, $p < 0.01$). It can be concluded that as attitude

increases, consumers' intention to adopt smart speakers will increase. The overall regression on model 4 is significant, as shown by the F-statistic of 20.744 ($p = 0.000$). The model has a moderate fit of 21% in explaining the dependent variables. The adjusted R square is 0.23 which indicates the variance of intention to adopt can be explained for 33% by attitude, PU, PEOU, security and price. Detailed result revealed that only attitude ($\beta = 0.54$, $p < 0.01$) were positively significant in contributing to the model. PEOU ($\beta = 0.01$, $p > .01$), PU ($\beta = 0.10$, $p > 0.01$), security ($\beta = -0.00$, $p > 0.01$), and price ($\beta = -0.11$, $p > 0.01$) did not contribute to the model. It can be concluded as attitude increases, intention to adopt also increases. To compare the result when attitude is added as the independent variables, the regression analysis was impacted. The adjusted R square was slight increased when attitude was added. The significance was also impacted where before adding attitude to IV, only PU and PEOU were significant. However, after adding attitude, only attitude was significant. Overall, the adjusted R square proves that there is a statistically significant effect on intention to adopt.

One of the main objectives of this research is to see if attitude mediates the relationship between the factor and intention to adopt. This will determine whether H6, H7, H8, and H9 are supported or rejected. To test the mediation effect, Baron and Kenny (1986) guidelines were followed. To further analyse the mediation role of attitude, a PLS bootstrapping analysis was also examined. The result reveal that attitude has a significant effect on all independent variables towards intention to adopt. PU has an indirect effect of 82.25%, PEOU has an indirect effect of 71.21%, security has an indirect effect of 97.02% and price has an indirect effect of 419.94%. The result shows that price has the highest indirect effect towards intention to adopt. This indicate that the security of smart speakers affects the attitude of Malaysian consumer on whether to adopt the smart speakers or not.

Based on Baron and Kenny (1986), attitude mediates the relationship between independent variables and intention to adopt. Model 5 was added to test the relationship between age and gender to attitude. The result reveal that gender and age does not have a significant relationship to attitude ($p > 0.05$). The result shows negative insignificant relationship between gender and age to attitude. To further analyse, the Chi-square difference test was also examined for age and gender. It was found that there is no significant relationship between attitude and gender ($\chi = 0.441$). This can be concluded that gender does not mediate the relationship between attitude and intention to adopt. Moreover, the Chi-square difference test found that there is no significant relationship between attitude and age ($\chi = 0.566$). It can be concluded that both age and gender does not mediate attitude on intention to adopt.

Discussion and Conclusion

The main objective of the study is to examine if there is a relationship between the independent variables (PU, PEOU, security, and price), mediator (attitude) and dependent variables (intention to adopt) in Malaysia. This study also examined if gender and age moderate attitude. Different tests such as the regression analysis, Baron and Kenny's (1986) tests of mediation, and others were performed in order to investigate whether the hypotheses were supported or rejected. Table 6 summarizes the findings of the hypotheses testing. In this study, attitude mediates the relationship between factors and intention to adopt. However, gender and age does not moderate attitude. All hypotheses were accepted except H10 and H11.

Based on the result, TAM was proved to be right since they have a direct relationship with each other. The results implied that the higher the consumers perceive ease of use and usefulness, the more positive their intention to adopt towards smart speakers would be. This means companies should ensure that the product is useful and easy to use in order for consumers to positively perceives smart speakers which would lead them to adopt smart speakers. It can be concluded that PEOU and PU have a direct relationship with intention to adopt.

Table 6 Hypotheses Testing Summary

No	Hypothesis Statement	Results
1	H1: PU has a positive influence on attitude	Supported
2	H2: PEOU has a positive influence on attitude	Supported
3	H3: Level of security has a positive influence on attitude	Supported
4	H4: Price has a positive influence on attitude	Supported
5	H5: Attitude has a positive influence on intention to adopt	Supported
6	H6: Attitude towards smart speaker mediates the relationship between perceived usefulness and intention to adopt.	Supported
7	H7: Attitude towards smart speaker mediates the relationship between perceived ease of use and intention to adopt.	Supported
8	H8: Attitudes towards smart speaker mediates the relationship between security and intention to adopt.	Supported
9	H9: Attitudes towards smart speaker mediates the relationship between price and intention to adopt.	Supported
10	H10: Gender moderates the effect of attitude towards intention to adopt smart speakers.	Rejected
11	H11: Age moderates the effect of attitude towards intention to adopt smart speakers	Rejected

Security was a factor that was added into the TAM in order to examine other factors that could possibly have a significant relationship with intention to adopt. Security has been an issue when it comes to technology as it can invade consumer without the consumers' consent. Consumers would need to feel that their personal information is safe before they purchase a technology. Based on the correlation analysis, it was found that security had a positive direct relationship, however during the regression analysis, it was found that it does not have any significant relationship with intention to adopt smart speaker. These findings are almost consistent with the previous study such as Hoffman and Thuesen (2018) and Chalhoub and Flechais (2020). It can be concluded that security does not have any direct relationship with intention to adopt. Price is an important factor for any end user of a technological product and that price is influencing the level of expectation that people have towards smart speakers and its performance (Hoffman & Thuesen, 2018). If the price of the product is higher, it can suggest the quality and that consumers have a higher willingness to buy. Price can limit some consumers as it is a critical issue for many. Based on the correlation analysis, it was found that price does not have any relationship with intention to adopt. Similarly, during the regression analysis, it was found that price does not have a significant relationship with intention to adopt ($p > 0.01$). These findings are almost consistent from previous study such Oliveira et al (2016) and Zaharia and Würfel (2020). The result shows that as the price increase, consumers intention to adopt smart speaker will decrease.

This study acknowledges that because the data collection undertook during the COVID19 pandemic, it might have impacted consumers' views whether they should purchase smart speaker as they are on a limited budget. Furthermore, age has a negative influence on price. This could mean that as age increases, price decreases. The age between 23 – 29 years old had the highest participants (59.5%). Between the age of 23 – 29 years old, most consumers are

most likely getting employed or just getting married and starting a family. They might perceive smart speakers as a technology that they do not need as of right now. So, it can be concluded that they are most likely non-adopters, so they might see smart speakers as a financial burden for them. In conclusion, price does not have any direct relationship with intention to adopt.

Attitude looks at a person's judgement regarding a specific behaviour. It can either be favourable or unfavourable which influences the strength of the behaviour and beliefs. If a consumer has the positive attitude towards intention to adopt a smart speaker, they will be positively influenced. Based on the regression analysis, PU and PEOU are positively significant with attitude. These findings are almost consistent from previous study such as Davis et al (1989). This proves that H1 and H2 are supported in this study.

The nature of smart speakers makes it harder for consumers to trust smart speakers. Smart speakers are designed to have an active microphone which listens to all the conversations in its surrounding, consumers might feel that it can invade their privacy. Because of this, consumers might not have the intention to adopt smart speakers. The result from the regression analysis for this study confirmed that security have a positive relationship with attitude. This is consistent with previous studies such as Byrne (2020). This proves that H3 is supported in this study. Price is an important factor which influences attitude as it assesses the product based on perception of what is received and what is given.

Previous research such as Andersson and Heinonen (2002) found that if consumers have to pay a higher price for a product or service, they will be reluctant to pay for a product or service they are not familiar with. This would mean that if smart speakers want to compete in the smart speaker market, they will need to ensure that the price and quality of price is reasonable for consumers to have a positive attitude to adopt smart speakers. Based on the regression analysis for this study, price have a positive relationship with attitude. This is consistent with previous studies such as Ashfaq et al (2020). As the result shows, H4 is supported.

Attitude have been known to be an important factor that influences consumers' behavioural intention to adopt any technology, especially smart speakers. For consumers to have the intention to adopt smart speakers, they would need to have a positive attitude towards new technology. Based on the regression analysis for this study, attitude has a positive relationship with intention to adopt. This is consistent with previous studies such as Yang et al (2017). As the result shows, H5 is supported. Ensuring that positive attitude from the beginning will be an advantage as it can lead consumers to be a loyal customer to the company. Companies would need to ensure that consumers have a positive attitude in order to be influenced to have the intention to adopt smart speakers.

This study also examined whether attitude mediates the relationship between factors and intention to adopt. It was found that attitude does mediate the relationship between factors and intention to adopt thus H6, H7, H8, and H9 were supported. With this information, companies really need to ensure that consumers attitude are positive in order for them to have any influence on intention to adopt. As PU and PEOU increases, attitude will increase which will make consumers have positive attitude towards intention to adopt smart speakers. As the level of security and price are less concern for consumers, their attitude and intention to adopt will also increase. Ensuring that consumers are heard by the companies will allow consumers to feel they belong which will increase their loyalty towards the companies. This will help companies in their long-term relationship with consumers.

Lastly, this study looks at the moderating role of gender and age with attitude. This study examines whether gender and age have any moderating role with attitude. This study argued that gender and age does moderate the relationship with attitude. The result showed that there was no significant relationship between attitude with gender and age. With this result, it is confirmed that gender and age does not moderate the relationship between attitudes. This result

is consistent with previous studies by Chu (2019), Vahdat et al (2020), and Schudzich (2019). Therefore, H10 and H11 were rejected.

Theoretical and Practical Implications

Smart speakers have yet to have a strong presence in the Malaysian market. As it is new, there is a lack of study about the intention to adopt smart speakers in the Malaysian market. This study looked at previous studies to figure out which factors could explain why consumers have or have not yet had the intention to adopt smart speakers. Factors such as PU, PEOU, security, price and attitude were amongst the important factors. This study has proposed and validated relationship of different factors, attitude and intention to adopt. It is guided by TAM. These findings of the study supported that adding attitude as the mediator also has a greater effect on the TAM model. This research contributed to have a better understanding of intention to adopt smart speaker by extending the TAM model. TAM adapted TRA as the theoretical basis which looks at the user acceptance of information system. Because of the key purpose of TAM, it looks at the basic tracing of the impact of the external factors on the internal beliefs (PU and PEOU), attitude and intentions (Davis et al, 1989). As such current model integrates the model by adding security and price, attitude as the mediator, and gender and price as the moderator. Based on the result, all except security and price was found to have an impact towards intention to adopt on TAM. Adding attitude as the mediator on the conceptual framework could fill in the gaps which previous studies have filled (Park et al, 2018; Yang et al, 2017). The results were consistent with Park et al (2018) and Yang et al (2017). This shows that this has provided empirical evidence on the mediation of attitude on factors towards intention to adopt. In order for consumers to have the intention to adopt smart speakers, service providers, business model developers, and marketing practitioners would need to develop their promotional strategies in order to have a positive influence on consumers' attitudes.

Limitations and Suggestions for Future Research

According to Ioannidis (2007), limitations will reveal whether the current research work can be improved for future research. Limitations are acknowledged in this research, as all research have their own limitations. Firstly, this study took place during the COVID19 pandemic where many people worked from home or had lose their jobs. It was a difficult time for many who lost their jobs due to companies and organizations laying off their employees in order to keep the company running during the pandemic. This could cause many participants to see smart speakers as expensive and not a necessity which could affect the results. Secondly, this study only measured five different factors against intention to adopt in Malaysia. Based on the result, the added factors did not have any significant influence towards intention to adopt. Since different factors can take effect in different environment and country, future research would need to tailor factors that would best fit their environment and country. Thirdly, future research should find other ways to ensure that participants fully understood and comprehend the questionnaire before answering the questions. This will help future researchers to get more accurate responses. Fourthly, there are other methods of research design that this survey did not touch on, such as qualitative research. Future research should take qualitative research into consideration in order to have a deeper understanding from the consumers' point of view.

The age of participants is also a limitation in the current study. About 59.5% of the respondents are from the aged between 23-29 years old while only 1.5% age more than 60 years old. The result does not accurately show what the intentions of those in the older years category as it is only a small percentage. Future research should focus more on getting equal number of participants with different ages in order to accurately compare. Another limitation are languages. Malaysia is a country that speaks many languages with Malay, English, and Chinese being the three most used languages. It is a limitation with the survey as it did not translate into

Malay and Chinese. This limited the result as it only got participants who are able to read and understand English. The researcher was not able to translate it to Malay and Chinese due to the time limit as well as not understanding the languages. Future studies should ensure that if the population speaks different languages, they should tailor the survey language so there would not be any limitations.

This study uses the non-probability sampling since it is difficult to obtain a list of the population being studied. This study managed to get 200 participants, however, Malaysia has more than 32.60 million people. Due to lack of representation of the population, it is recommended to have a larger sample size for future studies. Future research could test the framework in other countries with modifications in order assess how participants in other countries perceive about the intention to adopt smart speakers. Future research could also use other theories to investigate consumers' intention to adopt smart speakers.

Future research could also include other factors that was not tested here. As the result show the model has a moderate fit of 21% in explaining the dependent variables. As such other factors not identified in this study explained 79% of the dependent variables. Future research could also include more moderating variables such as education, marital status, household, and income in order to expand the scope and coverage of the population. There were only two moderating variables in this study which limited the researcher to see the overall result of the Malaysians consumers' intention to adopt smart speakers.

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