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An Empirical Study on the Factors Influencing the Attitude and Behaviors Towards Smartphone Voice Assistant Usage

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Abstract. In the United States, citizens have a positive outlook towards voice assistants in general but show a negative attitude specifically towards smartphone voice assistants due to various factors. Currently, almost no data exist regarding smartphone voice assistant in Indonesia due to the lack of research regarding this technology. This paper aims to fill that gap by studying the factors affecting Indonesia, specifically Jakarta citizen attitude and behavioral intentions toward smartphone voice assistants. This study uses five variables based on previous literature: perceived usefulness, perceived ease of use, privacy concern, attitude, and behavioral intention to establish six research hypotheses. This paper utilizes the quantitative research type by conducting an online survey that includes all variable items to validate the research hypotheses. The online survey collected 400 respondents of Jakarta citizens that use smartphone voice assistants. SmartPLS was used to analyze the validity, reliability, and hypotheses of the study, while supporting data were processed using Microsoft Excel. The results show that all six research hypotheses are valid, in which perceived ease of use has a positive impact on perceived usefulness, perceived usefulness, perceived ease of use, and privacy concern have an effect towards user attitude, while the user attitude itself has a positive impact on their behavioral intention to use a smartphone voice assistant. The theoretical implications of this study are that perceived ease of use can become a factor that positively impact users' behavioral intention on using a smartphone voice assistant and hypotheses tests can show varied results on different target sample who lives in different areas and cultures. The practical implication found from this study is that companies should implement solutions for smartphone voice assistants that focus on the technology's perceived usefulness, perceived ease of use, and privacy concern, as those three factors significantly impact the user's attitude and behavioral intention.

Keywords: Voice assistant, smartphone, perceived ease of use, perceived usefulness, privacy concern, attitude, behavioral intention.

1. Introduction

Within the last few years, technological development has accelerated rapidly and greatly influenced people's activities even though there are still gaps regarding technology adoption in every part of the world (*The Impact of Rapid Technological Change on Sustainable Development*, 2019). One particular technology that is advancing rapidly is smartphones. With this tool, people can perform various activities, such as making calls, shopping, sending messages, watching movies, playing games, and many others. Based on Stock Apps, over 5,3 billion or 67% of the world's population already used smartphones in 2021, where this tremendous rate of usage resulted in stiff competition within the smartphone industry that requires them to implement innovative technologies to generate competitive advantages where one of those innovations that are currently being adopted is voice assistant (Azis, 2021; Sharma et al., 2016).

Voice assistant is an Artificial Intelligence (AI) device that listens to their user commands, and communicates with them in conversations to assist and complete tasks requested by their users (Hoy, 2018). The implementation of voice assistants has proliferated over the years. Based on a study from Juniper Research that with an expected growth rate of around 25,4% from the year 2019 to 2023, it is estimated that in the year 2023, around 8 billion voice assistants will be installed and ready to be used (*Digital Voice Assistants in Use to Triple to 8 Billion by 2023, Driven by Smart Home Devices*, 2018). Currently, various famous voice assistants are adopted for smartphone usages, such as Siri, Google Assistant, and Bixby (Thormundsson, 2022). In the United States of America, quite a lot of its population uses voice assistants in their daily life; where based on a survey published by Insider Intelligence in 2022, around 123,5 million or 42,7% of adults in the United States have often used and interacted with their smartphones voice assistant at least once a month (*Voice Assistants in 2022: Usage, Growth, and Future of the AI Voice Assistant Market*, 2022).

Unexpectedly, based on previously conducted surveys, the country that was just below The United States regarding smartphone usage rate is the Republic Nation of Indonesia. For a developing country, Indonesia has a high rate of smartphone users among its citizens. According to the Ministry of Communication and Information, smartphone users have reached 167 million people within Indonesia in the year 2021 (Hanum, 2021). The company NewZoo released a statistic report titled “Top Countries by Smartphone Users” in 2021, where Indonesia was ranked fourth globally for its high smartphone penetration, reaching 64,8%, just around 8% lower than the United States of America, which is highly developed country (*Top Countries by Smartphone Users*, 2021).

This large number of smartphone users in Indonesia may also be the reason that led to Google developing Google Assistant to have the capability to speak and understand the Indonesian language. In 2018, Google officially released Indonesian language capabilities in Google Assistant. Google Indonesia Head of Marketing, Veronica Utami, hoped that this language capability could encourage the people of Indonesia to use Google Assistant to ease their activities (Kartini Bohang, 2018). The implementation of the Indonesian language into Google Assistant illustrates that Indonesia can be a potentially significant target market for smartphone voice assistants. However, even if it is illustrated as so by these companies, do Indonesian people actually use smartphone voice assistants nowadays? If so, what do Indonesian people use them for, and what are the aspects that influence their attitudes and behaviors regarding the usage of this technology?

Based on a survey conducted by PWC in 2018 towards 1.000 United States respondents aged 18 to 64, most respondents frequently used a voice assistant to search for something online, ask a few quick questions, and check the news or weather. However, they do not use voice assistants that much when buying and ordering something. A high amount of the respondents (93%) was satisfied with voice assistants in general, which includes smartphone and standalone speaker voice assistants. But when it comes to the attitude and satisfaction with the usage of voice assistants specifically in smartphones, the respondents show a low rate of satisfaction in which only 38% were satisfied on using them. Where the survey result showed that the main factors which led to this low satisfaction rate are due to the respondent's frustration regarding the inadequate accuracy, understanding, and reliability that smartphone voice assistants provide for their users.

Another interesting finding from this report is that three main factors caused people to avoid experimenting with voice assistant technology. The first is due to their limited knowledge regarding the capabilities or usefulness that voice assistants can provide, the second is the lack of trust in voice

assistants protecting their privacy, and the third is the hesitation due to the price or complexity of using voice assistants (PWC, 2018).

Due to this interesting survey result from respondents in the United States, it is highly curious regarding the attitude and usage behaviors of Indonesian people toward smartphone voice assistants. However, even though Indonesia was just one rank below the United States on its smartphone usage rate, throughout our research on various journals, articles, and reports, there have been low to even non-existing data regarding the attitude and usage behaviors specifically towards voice assistant in Indonesia. In contrast, in the United States of America, there have been many studies and statistics regarding the usage of this technology (Arifin & Lennerfors, 2021). However, there are articles and reports regarding Indonesia's attitude on advanced technology in general. Based on a survey conducted by VMWare in 2020 ("Citizen-Government Partnership May Be a Key Differentiator for Indonesia's Post-Pandemic Recovery," 2022), Indonesian people have great enthusiasm for the latest technology. In the survey, 78% of the public are enthusiastic about AI, 85% about 5G, and 85% about face recognition. In addition, 80% of Indonesians are curious and ready to explore digital things. This can strengthen the evidence that Indonesia is one of the countries that have good market prospects in the technology sector. However, 79% of respondents stated that security is the most critical factor in the use of technology, especially technology related to financial services. This is slightly lower than the percentage in Southeast Asia, which is 82%. In addition, 51% of Indonesian respondents have concerns if their data being tracked and recorded by an institution. This is also lower than the percentage in Southeast Asia, which is 57% (*Seamless Digital Experiences and Frontier Technologies Underpin Growth of Indonesia's Innovation-Led Financial Ecosystem*, 2022). This report shows that Indonesian people have positive attitudes to new technologies but fear for their privacy when they use them.

As a result of these various phenomena, the authors become motivated to research the factors that have an impact on the attitude and behaviors towards the usage of smartphone voice assistants in Indonesia, specifically in Jakarta. This is because Jakarta has the highest mobile phone usage in Indonesia, reaching 77% of its population, and with the highest Information and Communication Technology Development Index rate (7,46) compared to other Indonesia provinces in 2020, making the population of Jakarta as an excellent subject for this study (*Indeks Pembangunan Teknologi Informasi Dan Komunikasi (IP-TIK) 2020*, 2021; *Share of Population Owning a Mobile Phone in Indonesia from 2012 to 2021*, 2022; Syaiful Anwar, 2021). Therefore, based on the findings above, this study will be titled "An Empirical Study on the Factors Influencing the Attitude and Behaviors Towards Smartphone Voice Assistant Usage".

2. Literature Review

To support the discussions and results from this study, a literature review must be conducted to ensure that the research is carried out properly and has a theoretical foundation based on previous studies. The following is this study's literature review (*Organizing Your Social Sciences Research Paper*, 2023).

2.1. Artificial Intelligence

Artificial Intelligence (AI) is a computer system that can reproduce human cognition based on data to make decisions (Hassani et al., 2020). The Logic Theorist initialized by Cliff Shaw, Herbert Simon, and Allen Newel is said to be the proof of concept for AI. This proof of concept was introduced at the Dartmouth Summer Research Project on Artificial Intelligence (DSRPAI) conference in 1956, in which the program was created to imitate human problem-solving skills. From 1957 to 1974, the Logic Theorist algorithms were enhanced, and people could better understand which algorithm to apply to their problems. This product is one of the first iterations of the advanced technology named AI (Anyoha, 2017). Nowadays, the implementation of AI can be carried out in various forms and is widely used to create automated, thoughtful, and intelligent systems based on users' needs (Sarker, 2022).

One technology that uses AI-based modeling is modern voice assistants, such as voice assistants embedded in smartphones. The implementation of AI in the voice assistant can be seen from how AI programming constantly refines its algorithm to provide the best relational answer. The voice assistant can work with encoding and decoding systems, like when two people communicate (Chotia, 2022). The voice assistant is also implemented with speech recognition and voice recognition from AI, powered by

advanced solutions such as Machine Learning (ML) and Natural Language Processing (NLP) (Patel & Verma, 2022).

2.2. Voice Assistant

The voice assistant is an artificial intelligence device that listens to commands, communicates conversationally, assists users, and completes tasks (Hoy, 2018). Although voice assistants are only popular nowadays, voice assistant development has been around for a long time. Additionally, the voice assistant has varied functions and forms throughout its journey. One of the first product concepts of voice assistant, Radio Rex, was released in late 1922. It is a dog toy that would come out of its house when the user calls its name. However, this product implements the crudest voice recognition because the electromagnetic tuned to the frequency only recognizes adult male voices and does not respond to women or children (Maurya et al., 2021). After Radio Rex, the development of voice assistants continued when researchers at Bell Laboratories made Audrey in 1952. This device could only understand introductory speech units (such as several digits) and recognize speech spoken by a designated talker (Vox Creative, 2018).

Ten years later, an IBM engineer introduced the Shoebox at the World's Fair in Seattle, which can recognize 16 words and ten digits (0-9). This voice recognition is formed like a calculator which understands six control words (minus, plus, subtotal, total, off, and false) (Mutchler, 2017). Furthermore, the Harpy was introduced in 1976. Although it has almost the same function as the Shoebox, this device can recognize 1001 vocabulary and already understands pronunciation, phrases, and grammar (Vox Creative, 2018). This machine can provide feedback like a voice assistant when it does not understand the speaker. In the 1990s, the Dragon Dictate was very popular because it was the first product for consumers and could be purchased at an affordable price compared to its precursor. In addition, this machine can transcribe natural human speech without pauses between words (Mutchler, 2017).

People started to use voice assistants when Apple launched a modern digital voice assistant embedded in smartphones as the feature of the iPhone 4S named Siri (Murph, 2011). The first-generation version can set alarms, send text messages, check the weather, and make phone calls (Buteau & Lee, 2021; Murph, 2011). Shortly after, other big-name products appeared, such as Google Assistant, Cortana, and Alexa (Mutchler, 2017).

Nowadays, the functions of voice assistants are varied widely and can now be utilized from various devices such as mobile phones (i.e., Apple Siri) or can be bought as a separate piece of technology (i.e., Google Home, Amazon Alexa) (Pitardi & Marriott, 2021). Products such as Google Assistant; Siri; and Bixby (embedded on personal devices) are usually used for sending text messages, checking the weather, initiating phone calls, setting up the alarms, searching the internet, providing a recommendation for a restaurant, providing driving directions, completing purchases, playing music, sending messages, and many more (Andrea L. Guzman, 2019). There are also voice assistant products (i.e., Google Home and Amazon Alexa) that can connect and control smart home devices like refrigerators, televisions, washing machines, air conditioners, and even smart lights (Pal et al., 2021).

Based on the article “Evaluation of COVID-19 Information Provided by Digital voice assistant”, the two most prestigious smartphone voice assistants are Siri and Google Assistant (Goh et al., 2021). In hindsight, both smartphone voice assistants carried out the same essential functions as previously mentioned (Buteau & Lee, 2021; Murph, 2011). However, each has slight differences, leading to advantages and disadvantages. Below is a table that shows the different capabilities between the two voice assistants based on a previous study (Alepis & Patsakis, 2017).

Table 1: Voice assistant capabilities comparison

Capabilities	Siri	Google Assistant
Voice Authentication	✓	✓
Online Dependency	✓	
Access Device Settings	✓	✓
Post Private Information	✓	✓
Purchase	✓	✓
SMS/Calls	✓	✓
Third Party Apps	✓	✓
Permission Levels	System	System
Connectivity	Car (via CarPlay), Apple Watch, PC	Home, Auto, TV, Wearables
Always On	✓	
Wake up in secure Lock	✓	✓

2.3. Issues regarding Voice Assistant Usage

Although it is estimated that voice assistants will be installed on around 8 billion devices in 2023, several issues have developed that could be a concern for using voice assistants, especially ethical issues like privacy and trust (*Digital Voice Assistants in Use to Triple to 8 Billion by 2023, Driven by Smart Home Devices*, 2018; Han & Yang, 2018). Personal information collection (NPR, 2020), personal data usage and storage (Vimalkumar et al., 2021), and others listening while using the device (Easwara Moorthy & Vu, 2015) are examples of threats for considering using the voice assistant. Respondents' trust in the service provider is necessary for adopting or not adopting the technology where security risk and privacy threaten adoption (Han & Yang, 2018; Liao et al., 2019).

Additionally, based on the survey report established by PWC regarding voice assistants, it is stated that the limited knowledge of the full breadth of voice assistant capabilities, the hesitation due to complexity, and the lack of trust are the three main reasons that activities beyond basics are rarely used. Where people usually only perform basic daily activities and are not used for more severe situations (especially involving money) (PWC, 2018). Therefore, we conclude that the several issues that hinder voice assistants from being used regularly and explored massively are the ease of use, quality of being useful, and privacy concerns.

2.4. Technology Acceptance Model (TAM)

In 1989, Fred Davis developed the Technology Acceptance Model (TAM) (Davis, 1989). The model was developed with the purpose of better deduction regarding the acceptance of a new technology. The main factors affecting information technology utilization are perceived ease of use and perceived usefulness (Davis, 1989). Perceived usefulness can be described as the extent to which an individual thinks utilizing the technology will help them perform better while working. Then, perceived ease of use is the extent to which an individual thinks utilizing the technology requires small or less effort. TAM explained that acceptance is described by a person's attitude toward a technology and is accompanied by perceived ease of use and perceived usefulness (Davis, 1989). Attitude is described as the clincher of behavioral intention toward the usage of technology (Lunney et al., 2016). Additionally, behavioral intention is the motivating factor that captures a person's effort to perform the behavior (Ajzen, 1991; Ajzen & Fishbein, 1975; Thakur & Srivastava, 2013). Behavioral intention relates to how

frequently an individual utilizes and promotes a technology to others (Lee & Kim, 2022). A person's attitude regarding the usage of a technology is presumed to positively affect the person's behavioral intention, as the more positive someone's attitude towards the use of technology, their intention to utilize that technology will become higher (Ajzen & Fishbein, 1975; Davis, 1989).

In the previous study, it was shown that perceived ease of use and perceived usefulness influence an individual attitude toward voice assistants. Then, behavioral intention to use voice assistant is influenced by the user's perceived usefulness and attitude regarding voice assistant, while perceived ease of use is presumed to positively affect the voice assistant's perceived usefulness (Pal et al., 2021). Thus, from the explanation and literature review of previous studies, this study will use the following variables: perceived ease of use, perceived usefulness, attitude toward using, and behavioral intention to use.

2.5. Adoption of Voice Assistant: Using an Extended Version of TAM

Based on previous research, the TAM model can be used to study the factors influencing the attitude and behavior intention to use voice assistants. However, TAM is often criticized for being too simplistic to conclude technology adoption. In this regard, it is necessary to extend TAM to study the factors that influence the attitude and behavior intention to use voice assistants (San-Martín et al., 2013).

In the research from PWC, there are three reasons why many people do not want to use voice assistant technology. One of which is a lack of trust. There are several threats from voice assistant technology regarding privacy issues, such as personal information collection, data usage, and being heard by someone else while using this technology. Because of that, the privacy concern can be analyzed further as the factors affecting the users' attitude toward using this technology. Therefore, this study extends the TAM model with a new factor: privacy concern (PWC, 2018).

Privacy concern is the concern that someone's personal information might be exploited unpredictably by someone else (Işıkay, 2021). In voice assistant usage, there are user concerns regarding their privacy, such as personal data misuse (Pal et al., 2021). In the previous study, privacy concerns negatively impact user attitude toward voice assistants (Buteau & Lee, 2021). Therefore, based on these statements and related issues, this study adopts the TAM model with the extended version, which uses five variables: perceived usefulness, perceived ease of use, privacy concern, attitude, and behavioral intention. Below is the hypothesized research model of this study.

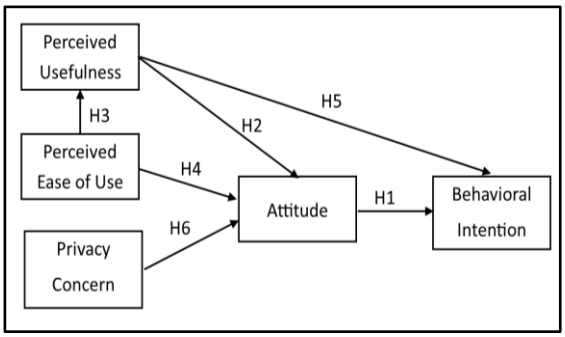

Fig. 1: Hypothesized research model

In formulating the research hypothesis for this study, the authors conducted analyses first on other studies related to technology acceptance in Indonesia. This analysis aims to ensure that the research that will be carried out will be relevant to the situation in Indonesia.

A previous study on the acceptance of the Wonderful Indonesia Application (Natalia et al., 2019) found that attitude significantly positively influences behavioral intention regarding the usage of the application. This indicates that in using the application, the user's attitude affects their behavioral intention to use the application. It was also found that perceived usefulness has a significant positive influence on the user's attitude regarding the application usage. It means that the application functionality influences user's attitude. Next, perceived ease of use was also found to influence the application's perceived usefulness significantly. This means that the easier the application is used by its users, the more the functionality of the application can be known. Next, in this study, perceived ease of

use was found to influence users' attitude regarding the application significantly. As a result, it is concluded that if the application is easier to use, the more positive the user's attitude toward the application. Based on the literature, the following are the proposed hypotheses:

H1: Attitude has a positive impact on the behavioral intention of the users to use smartphone voice assistant

H2: Perceived usefulness has a positive impact on the user's attitudes toward using smartphone voice assistant

H3: Perceived ease of use has a positive impact on the perceived usefulness of smartphone voice assistant

H4: Perceived ease of use has a positive impact on the user's attitudes toward using smartphone voice assistant

In another paper that analyses the acceptance of the application of pixel technology within Facebook ads among advertisers in Indonesia, which was studied using TAM (Tikno, 2018), the study results concluded that perceived usefulness has a significant effect on the behavioral intention to use the technology. This shows that the implemented pixel technology's perceived usefulness greatly influences Indonesian advertisers' behavioral intentions. Based on this literature, the following is the proposed hypothesis:

H5: Perceived usefulness has a positive impact on the behavioral intention of the users to use smartphone voice assistant

Based on VMWare Survey, 51% of Indonesian respondents are concerned when an institution tracks their data. An Oxford University study also shows that most mobile apps have utilities that can track users' data. This indicates that Indonesian people are uncomfortable when their data are being tracked, which makes them think twice when doing something related to their data, including using an application (*Seamless Digital Experiences and Frontier Technologies Underpin Growth of Indonesia's Innovation-Led Financial Ecosystem*, 2022). It can be concluded from these studies that privacy concerns negatively impact the user attitudes in Indonesia toward the usage of technological devices. Based on this data, the authors propose the following hypothesis:

H6: Privacy concern has a negative impact on the user's attitudes toward using smartphone voice assistant

3. Methodology

After reviewing previous studies and hypothesizing the research model, the study research techniques must be determined (*Organizing Your Social Sciences Research Paper*, 2023). This study will use the quantitative type of research to collect the needed data, as quantitative is a research type that implements survey methods to gather data from a large population. The data that will be collected for this research will be responses from citizens living in Jakarta, which the collected data would then be connected to the theoretical basis utilized by this study.

3.1. Population and Sample

For this study, the authors have established the research target subjects as the population of Jakarta whereas of 2021, the population have reached 10.644.776 citizens according to Indonesia's Central Agency on Statistic (BPS) (*Total Population of Special Capital District Jakarta According to Age Group and Gender 2019-2021*, 2022). Based on this population, the targeted sample will be determined by using Slovin's formula to calculate the smallest sample size for a population of unknown certitude (rono, 2018), which is as follows:

$$n = \frac{N}{1 + Ne^2} = \frac{10.644.776}{1 + 10.644.776 \times (0{,}05)^2} = 400$$

Details:
n = Size of sample
N = Size of population
e = Error tolerance

The total population in Jakarta is 10.644.776 citizens, and the margin of error of this study is 5%. Using the Slovin's formula, the targeted sample was calculated to be 400 respondents.

3.2. Research Variables

This study will use the following variables based on previous explanations and research, where the statements that will be used for this research survey are heavily referenced to previously related published papers. For perceived usefulness, three items were created to indicate whether smartphone voice assistants are helpful for the user's life. For perceived ease of use, four items were created to indicate whether the smartphone voice assistant is easy to use. For privacy concern, three items were created to indicate whether users are concerned regarding their data privacy when using smartphone voice assistants. For attitude, three items were created to indicate whether the user's outlook toward the smartphone voice assistant is positive. For behavioral intention, two items were created to indicate whether users intend to use smartphone voice assistants more frequently in the future.

Table 2: Research variables

Variables	Items	Statement	Source
Perceived Usefulness	PU1	Using smartphone voice assistant will enable me to accomplish tasks more quickly	(Pal et al., 2021).
	PU2	Using smartphone voice assistant will increase my productivity	(Pal et al., 2021).
	PU3	Using smartphone voice assistant will make my everyday life easier	(Pal et al., 2021).
Perceived Ease of Use	PEOU1	I find that smartphone voice assistant to be easy to use	(Song et al., 2019).
	PEOU2	I find that it is easy for me to interact with smartphone voice assistant	(Pal et al., 2021).
	PEOU3	I feel that learning how to operate smartphone voice assistant will be easy for me	(Pal et al., 2021).
Variables	Items	Statement	Source
	PEOU4	I find it easy to get a Smartphone Virtual Assistant to do what I want it to do	(Song et al., 2019).
Privacy Concern	PC1	I think that my privacy is not protected when I am using smartphone voice assistant	(Pal et al., 2021).
	PC2	I feel that smartphone voice assistant will share my personal information with others without my consent	(Pal et al., 2021).
	PC3	I feel that it is risky to disclose my personal information to my smartphone voice assistant	(Pal et al., 2021).

Attitude	ATT1	I feel positive towards the usage of smartphone voice assistant	(Song et al., 2019).
	ATT2	I think that using smartphone voice assistant is a good idea	(Song et al., 2019).
	ATT3	I think that using smartphone voice assistant is a smart way to get things done	(Song et al., 2019).
Behavioral Intention	BI1	I plan to use smartphone voice assistant more frequently in the future	(Pal et al., 2021).
	BI2	I think that I will use smartphone voice assistant more frequently in the future	(Pal et al., 2021).

3.3. Data Analysis Method

For this study, the authors will conduct the data analysis by ensuring that all data from the required academic basis has been properly collected. The responses will then be calculated and narrowed down for each survey question according to the number of participating respondents. Then, the data will be correlated to this study type of research and with previous existing theoretical underpinnings. All the collected data will be compiled for the final step. The following are the methods that this study uses to analyze the data:

3.3.1. Data Collection Technique

This study will use the questionnaire method for the data collection, as it is the most effective and efficient technique for gathering data from a large population. The study will also use Snowball Sampling as the sampling technique. The data collection will start with the small population that the authors recognized, where the sample will proliferate by asking initial respondents to convince other people to fill out the research questionnaires.

3.3.2. Validity and Reliability Test

Validity is defined as how accurately a concept is measured in quantitative research (Heale & Twycross, 2015). For this study, the authors will conduct a validity test to determine if the survey responses are either valid or not valid (*Correlations, Reliability and Validity, and Linear Regression*, 2010).

Using the Pearson's correlation table, it is determined that the Pearson's correlation coefficient (r) of the questionnaire item should be greater than 0,098 as the targeted sample is 400 and the significant rate of this study is 5%. This study will use SmartPLS to calculate the r-value obtained from the outer loadings in the PLS Algorithm Section. If a questionnaire item has an r-value of under 0,098; that item will be removed.

The next test is the reliability test, which can be defined as the consistency in measurement (Heale & Twycross, 2015). This test aims to discover the consistent measurement between the degree of the test with the measured target. This study will use SmartPLS to calculate the reliability coefficient or Cronbach's alpha value, where the value is obtained from PLS Algorithm Section.

For each variable, Cronbach's alpha value must be between 0,60 and 0,79 to be considered acceptable, while it can be considered good if it is over than 0,80. However, if Cronbach's alpha value is below 0,60; it can be considered poor. If Cronbach's alpha value is under 0,60; the questionnaire item of the variable that causes the low value should be removed (Sekaran, 2019). Thus, it is determined for this study that the coefficient score needed for a variable to be reliable is greater than 0,60.

3.3.3. Hypothesis Test

For this study, hypothesis testing was conducted by examining the T-statistics value. The T-test was used to test the study hypothesis about the effect of each independent variable partly on the dependent variable. This study will calculate the T-statistics to see the relationship between the variables. The T-statistics value is found by going through the bootstrapping procedure. In this study, bootstrapping was

carried out using SmartPLS, where the T-statistics value is obtained from the path coefficients section. In testing the hypothesis, a relationship is significant when the T-statistics value is greater than 1,96 (Ghozali, 2016).

4. Results and Discussion

After conducting the investigation utilizing the research methods and techniques previously established, the results must then be analyzed. The following are the discussion and analysis results from the collected data needed for this study.

4.1. Readability Test Results

The main objective of carrying out a Readability test is to make sure that every sentence applied for each questionnaire item can be effective and understood easily, which would reduce occurring errors. For the readability test, we distributed our questionnaire draft to 14 individuals residing in Jakarta for the test, where the questionnaire contains various question types such as demographic, Likert scales, multiple choice, and open-ended questions. The readability test is conducted with each individual through an online video call. From the result of the readability test, all 14 individuals responded positively in which every questionnaire item can be easily understood, and there were no ambiguous sentences to them (Rahmadina, 2015).

4.2. Validity and Reliability Test Results

With the collected responses from 400 respondents, the authors carried out the validity test for all variable items within the questionnaires. This test obtains the r-value from data processing results via the SmartPLS application in the outer loadings section. The following are the results obtained from the application calculation process.

Table 3: Validity test results

Variables	Item	r-value	Validity
Perceived Usefulness	PU1	0,91	Valid
	PU2	0,91	Valid
	PU3	0,92	Valid

Variables	Item	r-value	Validity
Perceived Ease of Use	PEOU1	0,93	Valid
	PEOU2	0,94	Valid
	PEOU3	0,90	Valid
	PEOU4	0,91	Valid
Privacy Concern	PC1	0,89	Valid
	PC2	0,94	Valid
	PC3	0,84	Valid
Attitude	ATT1	0,92	Valid
	ATT2	0,91	Valid
	ATT3	0,90	Valid
Behavioral Intention	BI1	0,97	Valid
	BI2	0,97	Valid

Based on the validity test result with the sample of 400, a significance of 5%, and a critical value of 0,098 in the Pearson's correlation table, the r-value of all variable items is greater than the critical value. This means that the questionnaire items used in this research are all valid.

Next, the reliability test was also carried out for all variables within the questionnaires. In this test, Cronbach's alpha is obtained from data processing results via the SmartPLS application in the construct

reliability and validity section. The following are the results obtained from the application calculation process.

Table 4: Reliability test results

Variables	Cronbach's Alpha	Results
Perceived Usefulness	0,90	Reliable
Perceived Ease of Use	0,94	Reliable
Privacy Concern	0,87	Reliable
Attitude	0,89	Reliable
Behavioral Intention	0,94	Reliable

Based on the previous explanations, if the questionnaire Cronbach's alpha value is greater than 0,6; it is declared reliable (Sekaran, 2019). From the test result, the value of all the questionnaire items is greater than 0,6 meaning that the research questionnaire is reliable.

4.3. Path Diagram

For this study, the authors have established the path diagram based on the variables chosen with the SmartPLS application. The path diagram can be seen in the following figure.

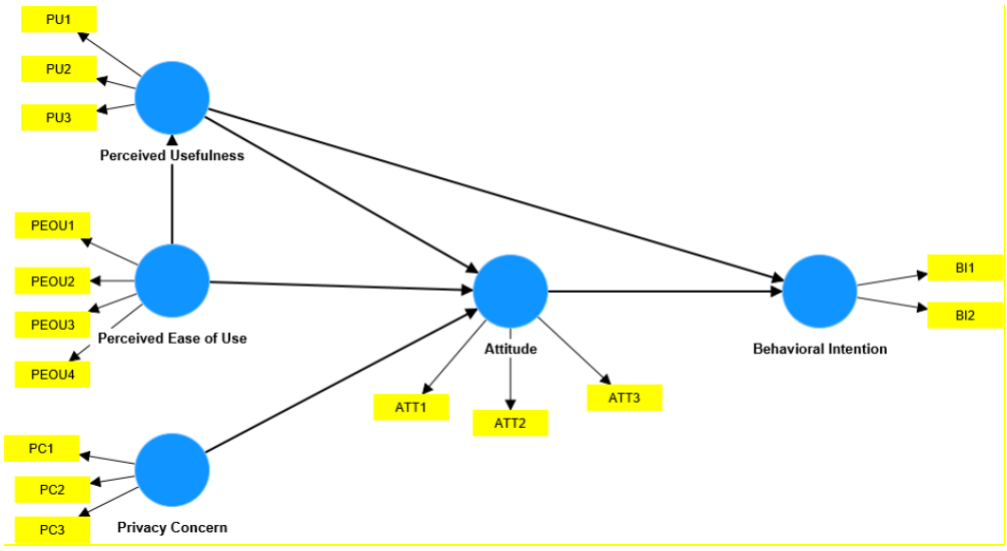

Fig. 2: Path diagram using SmartPLS

4.4. Respondent Demographics

After the survey, 400 respondents answered the questionnaire statement validly. The following represents the respondent's demographic to support further discussion and analysis of the collected survey data.

4.4.1. Gender

The following is the statistic of the respondent's gender. In which the statistic is illustrated within a pie chart.

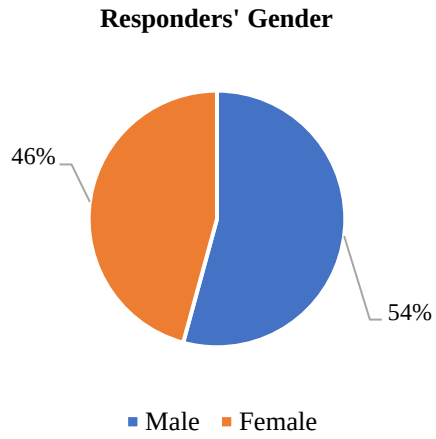

Fig. 3: Presentation of the gender statistic in the pie chart

Based on the distributed research questionnaire, most survey respondents are male, with 217 respondents (54%). In comparison, the total number of female participants in this survey is 183 (46%).

4.4.2. Age

The following is the statistic of the respondent's age. In which the statistic is illustrated within a pie chart.

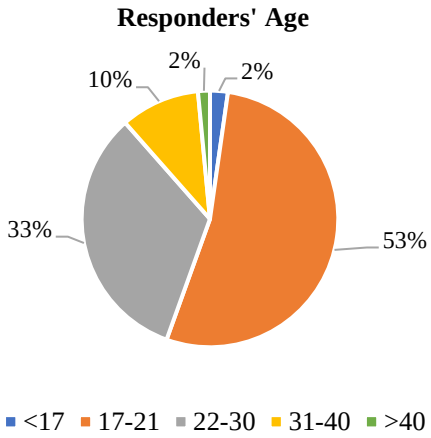

Fig. 4: Presentation of the count of age in the pie chart

Based on the distributed research questionnaire, most of the respondents were aged 17-21 years, with a data value of 213 respondents (53%), followed by respondents aged 22-30 years, with a data value of 132 respondents (33%). The third position is occupied by respondents who are aged 31-40 years, with a data value of 40 respondents (10%), followed by respondents aged <17 years in the fourth position, with a data value of 9 respondents (2%). Lastly, respondents who are aged >40 years have the least number, with a data value of 6 respondents (2%).

4.5. Survey Results

Below is the collected response data from the survey. That was filled out by 400 respondents validly.

4.5.1. Smartphone Usage Frequency

The following is the statistic of the respondent's smartphone usage frequency. In which the statistic is illustrated within a pie chart.

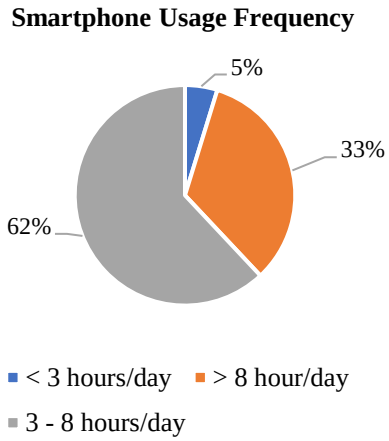

Fig. 5: Presentation of smartphone usage frequency in the pie chart

Based on the survey data from 400 respondents regarding smartphone usage frequency, most respondents used their smartphones at least 3 to 8 hours per day, with a data value of 62% (248 respondents). In comparison, the second majority used their smartphones more than 8 hours per day, with a data value of 33% (133 respondents). Meanwhile, only 5% (19 respondents) use their smartphones for under 3 hours daily. This shows that citizens of Jakarta frequently use their smartphones for many hours in their daily life.

This is in line with research conducted by BPS in 2020 that the Index Level for the Development of Information and Communication Technology in Jakarta is 7,46 out of 10, which is relatively high (*Indeks Pembangunan Teknologi Informasi Dan Komunikasi (IP-TIK) 2020*, 2021). So, it can be concluded that Jakarta citizens have a good understanding of technologies such as smartphones and are highly dependent on using them.

4.5.2. Intensity of Using Smartphone Voice Assistant

The following is the statistic of the respondent's intensity on using a smartphone voice assistant. The statistic is illustrated within a doughnut chart and categorized between ages.

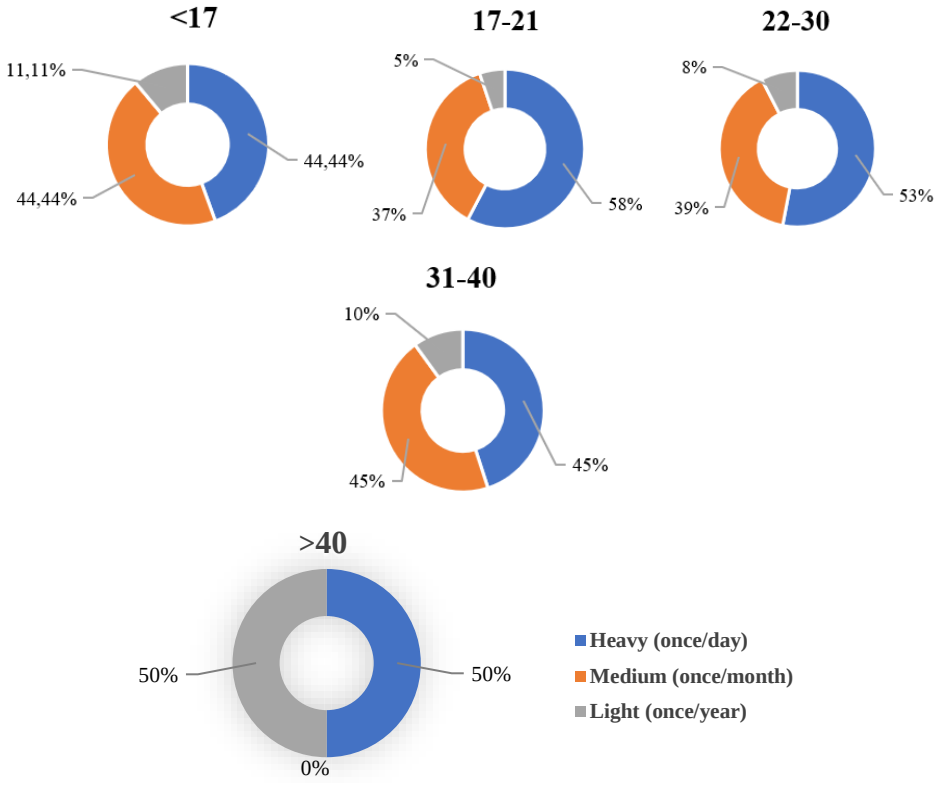

Fig. 6: Presentation of smartphone voice assistant usage intensity in doughnut charts

As in the above doughnut charts, the intensity of using smartphone voice assistant is represented into three categories. The categories are heavy (at least once/day), medium (at least once/month), and light (at least once/year).

From the analysis, young people aged 17-21 years are statistically more intense and frequently using their smartphone voice assistant compared to other generations, followed by adults aged 22-30 years. In comparison, older adults over 40 years have the lowest usage intensity percentage. Thus, these results show that teenagers in Jakarta aged 17-21 years are more accepting, satisfied, and frequent in using the smartphone voice assistant technology compared to people younger or older than them.

This study has different results from research conducted in the United States. In the U.S., the average smartphone voice assistant users are 5-49 years (PWC, 2018). Meanwhile, in Jakarta, users aged 17-21 years mostly use smartphone voice assistants. This shows that even though the level of smartphone usage in the U.S. and Indonesia is both high, there are different behaviors between users in these two countries.

4.5.3. Most Frequently Used Brand of Smartphone Voice Assistant

The following is the statistic of the respondent's most frequently used smartphone voice assistant brand. In which the statistic is illustrated within a pie chart.

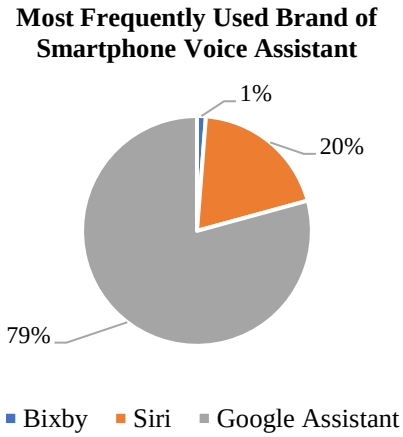

Fig. 7: Presentation of smartphone voice assistant most used brand in the pie chart

Based on the chart above, the most frequently used brand of smartphone voice assistant is Google Assistant (79%), followed by Siri (20%). Bixby has the lowest usage rate of these three popular smartphone voice assistants (1%). Thus, it can be concluded that most Indonesian people use Google Assistant as their smartphone voice assistant.

This result can be due to many Indonesians owning smartphone brands that use the Android operating system with Google Assistant installed, such as Oppo, Samsung, Xiaomi, Vivo, and others. Meanwhile, the use of Apple smartphones is still relatively low in Indonesia (9,23%) (Adisty, 2022). Thus, the high adoption rate of Android smartphones in Indonesia indicates that most smartphone users use Google Assistant.

4.5.4. Most Frequently Used Smartphone Voice Assistant Function

The following is the statistic of the respondent's most frequently used smartphone voice assistant functions. In which the statistic is illustrated within a bar chart.

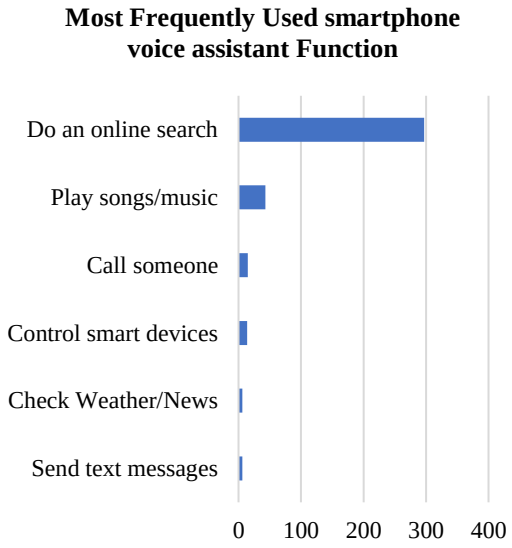

Fig. 8: Presentation of smartphone voice assistant most used function in the bar chart

Based on the chart above, the most frequently used smartphone voice assistant function is to perform online searches (74%). Besides that, many people use smartphone voice assistants to play songs/music (11%), whereas other smartphone voice assistant functions are rarely used. This can be seen in the chart above, where the use of other functions is still 2% or lower, such as setting the alarm/timer and seeing the traffic condition. From the chart above, it can be concluded that most Indonesians use smartphone voice assistants to search for something online quickly.

The results of this study are in accordance with a report made by DataReportal, where the main reason for using the internet in Indonesia is to find information (83,2%) (Kemp, 2023). The most common way to find information is to search through search engines. This could be the cause of the high use of smartphone voice assistants to perform online searches. With a smartphone voice assistant, users can search for information by simply saying it without typing, making it easier to do online searches.

4.6. Hypotheses Test and Discussion

Based on the survey results, 400 respondents from Jakarta answered all items in the research survey validly. The authors have calculated the T-statistics for all research hypotheses with SmartPLS. The calculation result can be viewed in the following table.

Table 5: T-statistics for hypothesis test

Variable Relationship	T-statistics (|O/STDEV|)
Attitude -> Behavioral Intention	7,96
Perceived Ease of Use -> Attitude	7,51
Perceived Ease of Use -> Perceived Usefulness	22,87
Perceived Usefulness -> Attitude	10,52
Perceived Usefulness -> Behavioral Intention	6,84
Privacy Concern -> Attitude	4,00

The table shows that all variable relationships or research hypotheses are valid as the T-values are over 1,96. The following are the detailed analysis and discussion for each research hypothesis:

4.6.1. Hypothesis 1 (Attitude Has a Positive Impact on The Behavioral Intention of The Users to Use Smartphone Voice Assistant)

For this study, the authors have established the 1st hypothesis which stated that "attitude has a positive impact on the behavioral intention of the users to use smartphone voice assistant". Based on the table above that was calculated from the collected survey data, the T-value of the 1st hypothesis is 7,96. As the T-value is over 1,96; it can be concluded that the 1st hypothesis is valid.

The statement that "attitude has a positive impact on the user's behavioral intention" has been agreed impliedly by many researchers from the past. Based on past studies, attitude was stated as one of the variables that can predict and explain individual behavior. A positive attitude can make a person more inclined to do or approach a specific behavior, while a negative attitude can make a person more uninclined and avoid that behavior (Ajzen & Fishbein, 2000). Thus, it is indicated that a person's attitude toward the use of technology can significantly impact their behavioral intention.

From these findings, it can be concluded that the more positive an individual attitude towards smartphone voice assistant, the more willing they are to use the technology. This shows that voice assistant companies should focus on what their technology can do and how to make sure that smartphone voice assistant can be seen as a modern and useful technology by the public.

One of the ways that companies can improve Indonesian people's attitude is by creating easy-to-understand advertisements that show how useful smartphone voice assistants are for their daily lives and by advertising that current smartphone voice assistants can respond to Indonesian language commands. This can be an effective solution to ensure that everyone who already have this technology installed in their smartphone can realize its value and usefulness.

4.6.2. Hypothesis 2 (Perceived Usefulness Has a Positive Impact on The User's Attitudes Toward Using Smartphone Voice Assistant)

For this study, the authors established the 2nd hypothesis which stated that "perceived usefulness has a positive impact on the user's attitudes toward using smartphone voice assistant". Based on the table above that was calculated from the collected survey data, the T-value of the 2nd hypothesis is 10,52. As the T-value is over 1,96; it can be concluded that the 2nd hypothesis is valid.

Throughout the development and evolution of technologies, one of the main factors determining someone's attitude toward a technology is how useful they are for their daily life or work. This is in accordance with various studies conducted by past researchers, where one research finds that the users perceived usefulness positively influenced their attitude towards web-based learning systems. Whereas another research also concluded that users perceived usefulness influences the user attitude positively toward wearable fitness devices (Song et al., 2019).

Based on these findings, it can be concluded that perceived usefulness positively impacts the user attitude regarding smartphone voice assistants. Thus, voice assistant companies must continue innovating new capabilities and valuable features for smartphone users. Some recommendations are to enhance the online search function of smartphone voice assistant as it is the most used feature, and also intensely advertise and improve the voice recognition feature that the technology has. With this feature, the technology will only respond to commands given by the verified user.

4.6.3. Hypothesis 3 (Perceived Ease of Use Has a Positive Impact on The Perceived Usefulness of Smartphone Voice Assistant)

For this study, the authors established the 3rd hypothesis which stated that "perceived ease of use has a positive impact on the perceived usefulness of smartphone voice assistant". Based on the table above that was calculated from the gathered survey data, the T-value of the 3rd hypothesis is 22,87. As the T-value is over 1,96; it can be concluded that the 3rd hypothesis is valid.

In theory, two significant variables affect a user's acceptance of a specific technology: the user's perceived usefulness and perceived ease of use, even though the latter was stated to have a weaker influence (Cha, 2010). Due to this, it can be assumed that the user's perceived ease of use positively impacts the user's perceived usefulness. This theory is backed up by research conducted in the past, where it is founded that other than being a significant determinant of the user's attitude toward online learning technology, perceived ease of use is also the primary determinant of the technology's perceived usefulness, thus showing the two variables positive relationship (Farahat, 2012).

From these findings, it can be concluded that the user's perceived ease of use positively impacts their perceived usefulness toward smartphone voice assistants. Thus, if companies improve smartphone voice assistant's "ease of use" where all of its features are more accessible and easier to be utilized, the technology will be seen as more valuable by the users. Some recommendations that can be implemented to improve users' perceived ease of use is to remove obstacles that may cause the user "pains" when accessing the technology features, such as providing an offline mode and enhancing smartphone voice assistant voice command accuracy. Companies can also provide a quick tutorial video for users when booting up the technology for the first time so that they can know how to access all of the valuable capabilities provided by their smartphone voice assistant.

4.6.4. Hypothesis 4 (Perceived Ease of Use Has a Positive Impact on The User's Attitudes Toward Using Smartphone Voice Assistant)

For this study, the authors established the 4th hypothesis which stated that "perceived ease of use has a positive impact on the user's attitudes toward using smartphone voice assistant". Based on the table above that was calculated from the collected survey data, the T-value of the 4th hypothesis is 7,51. As the T-value is over 1,96; it can be concluded that the 4th hypothesis is valid.

In theory, perceived ease of use can be described as the extent to which an individual believes that a specific technology or system can be free from effort or difficulty, in which the user would be more accepting regarding adopting that technology (Davis, 1989). From this, it is assumed that a user's perceived ease of use regarding a particular technology can positively affect their attitude toward accepting them. Studies from the past have also resulted in similar findings, in which it was found that perceived ease of use positively affects user's attitude regarding the adoption of wearable fitness devices and online learning technology (Song et al., 2019).

Based on these findings, it can be concluded that the higher someone's perceived ease of use towards smartphone voice assistant, the more positive their attitude is regarding the technology adoption. Thus, to improve the user's attitude, companies must ensure that their smartphone voice assistant products are easy to use and do not hinder the user from utilizing the technology. Some recommendations based on the collected survey responses are to enhance or even repair the voice accuracy of smartphone voice assistants, in which many of our respondents mentioned that the technology usually misinterpreted the commands given by their users where it provided them misleading and even wrong answers.

Another recommendation is to implement an offline mode for the smartphone voice assistant, where currently users can only use the technology while connected to the internet even though there are many features that "should not need" them to be connected, such as setting the alarm, playing music, and so on. By implementing a mode where users can always use smartphone voice assistant (albeit only providing some of its "offline" features) without needing an internet connection, they will find the technology to be easier to use and not need heavy dependencies on their internet connection, resulting to the improvement of their attitude towards smartphone voice assistant (Davis, 1989).

4.6.5. Hypothesis 5 (Perceived Usefulness Has a Positive Impact on The Behavioral Intention of The Users to Use Smartphone Voice Assistant)

For this research, the authors established the 5th hypothesis which stated that "perceived usefulness has a positive impact on the behavioral intention of the users to use smartphone voice assistant". Based on the table above that was calculated from the collected survey data, the T-value of the 5th hypothesis is 6,84. As the T-value is over 1,96; it can be concluded that the 5th hypothesis is valid.

In theory, perceived usefulness is one of the main variables significantly affecting a person's behavioral intention to use technology (Davis, 1989). Various past studies also backed up this theory. Where according to one research regarding social media, it was founded that perceived usefulness has a positive impact on the user's behavioral intention to use social media (Song et al., 2019).

From these findings, it can be concluded that perceived usefulness positively impacts the individual behavioral intention to use smartphone voice assistants. Thus, to increase Indonesian people's intention to use smartphone voice assistants more greatly, voice assistant companies must improve and increase their product capabilities to incentivize their consumers. Some recommendations that can be implemented to improve the user's perceived usefulness, is to enhance smartphone voice assistant most

used capability that is the online search function, and also the not well-known voice recognition feature that can ensure only verified users can give commands to their respective smartphone voice assistant.

4.6.6. Hypothesis 6 (Privacy Concern Has a Negative Impact on The User's Attitudes Toward Using Smartphone Voice Assistant)

For this research, the authors established the 6th hypothesis which stated that "privacy concern has a negative impact on the user's attitudes toward using smartphone voice assistant". Based on the table above that was calculated from the collected survey data, the T-value of the 6th hypothesis is 4,00. As the T-value is over 1,96; it can be concluded that the 6th hypothesis is valid.

The statement "privacy concern is negatively influencing the user's attitude toward using smartphone voice assistant" means that the higher the user's concern about their privacy (such as personal data tracking) can negatively affect the user's attitude towards smartphone voice assistant. This is in line with previous data collected from other researchers, such as the data collected by PWC from respondents in the United States of America. PWC stated that there is sensitive data tracking involving money in a smartphone voice assistant's feature, negatively affecting users' attitude toward using a smartphone voice assistant. These concerns lead to users' distrust and the fear of losing their privacy. This personal data tracking is a significant concern leading to the users' lack of trust and negative attitude (Muthukumaran, 2020; PWC, 2018).

Furthermore, this statement is supported by previous data collected from the VMWare survey regarding technology in general that took place in Indonesia, where most of the respondents from the survey are concerned when their data is being tracked. When performing something that requests access to their data, the users will feel uncomfortable and think twice about using that technology. This indicates that privacy concerns can negatively influence the user's attitudes towards a technology, such as smartphone voice assistant ("Citizen-Government Partnership May Be a Key Differentiator for Indonesia's Post-Pandemic Recovery," 2022).

From these findings, it can be concluded that the higher someone's privacy concern towards smartphone voice assistant, the more negative their attitude is regarding the technology adoption. Thus, companies should simplify their privacy policies to increase Indonesian people's trust in voice assistants. Voice assistant companies must briefly mention what data they will use from their users so that it is easy for them to read and understand (Jesse Redniss, 2022). In addition, companies can also give users options regarding what data is allowed for the company to use. This transparency can make users better understand what their data is used for, which will help them become more aware and feel safer regarding their privacy, as the smartphone voice assistant they are using does not give the impression of illegal data usage.

4.7. Study Implications

Various implications were constructed from this study based on the survey and hypotheses test results. The following are the implications divided into theoretical and practical.

4.7.1. Theoretical Implication

With the results from this study, there are various theoretical implications. From the study hypotheses test, it is shown that users' attitude positively affects their behavioral intention to use smartphone voice assistant (H1), while the user attitude itself is positively affected by their perceived usefulness and perceived ease of use (H2 and H4). This means that the higher user's perceived usefulness and perceived ease of use towards the technology will also indirectly affect the user's behavioral intention. While previously it was hypothesized that perceived usefulness has a positive impact towards the user's behavioral intention (H5) before conducting the research, the findings from this study provided the implication that perceived ease of use also affects the user's behavioral intention and should be considered as a research hypothesis in future voice assistant studies.

Another theoretical implication is also established from the hypothesis that privacy concern negatively impacts user's attitude regarding smartphone voice assistants (H6). From Debajyoti Pal's research paper towards adopting voice-enabled smart-home systems in Thailand, which this study uses for the literature review, the paper concluded that in Thailand user's privacy concern does not affect their attitude towards voice assistant as they are aware of the personalization-privacy paradox (Pal et

al., 2021). However, from the study conducted on smartphone voice assistant usage in Jakarta, the user's attitude is impacted negatively by the user's privacy concern, thus showing different results from previous papers and research. This difference in findings implied that the hypotheses test could provide different results when the targeted samples are also different, as Indonesian people are more concerned about their privacy while using new technologies, while people in other countries may have different ideals and concerns. These differences in people's mindsets should be considered in future voice assistant studies.

4.7.2. Practical Implication

With the results from this study, there are practical implications. From the study hypotheses test, it is shown that users perceived usefulness, perceived ease of use, and privacy concerns have an impact on users' attitude and implicitly on users' behavioral intention to use smartphone voice assistants.

For companies that produce voice assistant products in Indonesia, it is highly imperative for them to create new innovations or solutions for their products that can increase people's interest and intent to use them. Thus, the results from this study established the practical implication that companies should implement solutions related to the capabilities, usage complexity, and data privacy of smartphone voice assistants, as this study proves that those three factors affect the user's attitude and behavioral intention regarding this technology. Solution examples for each of these factors are to implement or enhance the voice recognition capability, release offline mode so that users can easily access features without needing the internet, and streamline the products' privacy policies so users can better understand how private their data are when using smartphone voice assistant.

5. Conclusive Remarks

The following is the study's conclusion and the potential future research. The conclusion was established from the supporting theories, discussion, and results previously explained and analyzed.

5.1. Conclusion

At the beginning of this research, it was found that only a few studies investigated the usage of smartphone voice assistants in Indonesia, which became the primary motivation to continue carrying out the study and fill out the current gap. The focus of this study is to analyze the factors that affect the attitude and behavioral intention to use smartphone voice assistant. Using the extended TAM model, it can be concluded that perceived ease of use and perceived usefulness positively impact the users' attitude, while privacy concerns negatively impact the user's attitude toward smartphone voice assistants. Furthermore, the user's attitude and perceived usefulness positively impact the user's behavioral intention to use smartphone voice assistants. Additionally, it is found that users' perceived ease of use can positively impact their perceived usefulness towards smartphone voice assistants.

Further investigation through this study also found that most Jakarta citizens, specifically individuals aged 17 to 20 years, are frequently intent and satisfied with using smartphone voice assistants. This finding is astounding as from the survey conducted by PWC, most U.S. citizens are dissatisfied with using smartphone voice assistant, whereas citizens of Indonesia, specifically in Jakarta, do. This result could be due to more advanced voice assistant types in the U.S., such as the speaker voice assistant Amazon Alexa.

From the result of this study, survey responses, and previous literature review, several recommendations can be implemented by smartphone voice assistant companies to positively improve Jakarta citizens' attitude and behavioral intention to use smartphone voice assistants based on the factors that influence them. First, the companies can create easy-to-understand advertisements that show the usefulness of smartphone voice assistants in everyday life and also push advertisements regarding this technology's capability to respond to commands in the Indonesian language. This will help smartphone voice assistants to be better known and seen positively by users that reside in Indonesia and makes them want to use this technology in their daily lives frequently.

The following recommendation is that companies must improve the smartphone voice assistant online search feature, especially in accurately receiving and responding to the given user commands. This is because users utilize the online search feature more than the technology's other capabilities. Additionally, companies can improve and extensively advertise the smartphone voice assistants' voice

recognition feature. Users can utilize this feature to ensure their voice assistant can recognize and only respond to commands given by their verified user, especially when performing shopping and transactions through them. These solutions and feature enhancement can significantly improve users perceived usefulness towards smartphone voice assistants, thus positively affecting their attitude and behavioral intention to use the technology.

Next, there are also recommendations that companies can implement to ease the use of smartphone voice assistants. The first and primary recommendation is to establish an offline mode for smartphone voice assistants. From the collected survey responses, it is found that the users cannot access the features and services provided by the technology if their devices are not connected to the internet. Thus, by providing an offline mode for smartphone voice assistant where users can still access and utilize the technology without any need of an internet connection (albeit with lesser features provided), users will find smartphone voice assistant to be easier to access and utilize whenever and wherever they are, without having to face limitations or dependencies for internet connection. Another recommendation is that companies can make easily accessible video tutorials or even show small hints when the users are utilizing their smartphone voice assistant, thus helping them to remember how to use all of the features provided by this technology. Implementing these solutions can help users become quicker and more efficient when using smartphone voice assistants, which would also positively improve their perceived usefulness and attitude towards the technology.

Finally, to help decrease users' privacy concerns when using smartphone voice assistants, one of the recommendations companies can apply is to streamline their privacy policies. This is intended so that users can read the policy easily and understand what data the company will use. In addition, the company can provide options for the users regarding what and which data the company is allowed to use.

It is hoped that the results from this study can contribute on filling the current gap towards voice assistant research in Indonesia and inspire others to continue research regarding this technology. Moreover, companies are also hoped to consider implementing the recommendations provided, so people from all walks of life, including citizens of Jakarta, will utilize smartphone voice assistant more frequently and have a better attitude towards using this advanced technology.

5.2. Limitations and Future Research

Throughout this study, the authors have faced several limitations, with the most apparent shortcoming being the uneven distribution of the survey respondents for each age group. This is because most survey respondents came from online survey platforms, where this survey recruiting method has a weakness in that most of the respondents are only young people, even if the platform can recruit many participants in a short period. This affects most of the current study's respondents who are 17-21 years old. Therefore in future research, besides utilizing online survey platforms, the survey can also be distributed offline and in written form so the respondent distribution by age can be more equal.

Additionally, this study only analyzes the user's attitude and behavioral intention toward smartphone voice assistants. It does not have the scope for analyzing the behavioral intention for other voice assistant environments that can be bought as a separate piece of technology, such as smart-home voice assistants (i.e., Google Home, Amazon Alexa). Therefore, future studies are hoped to focus on voice assistants in other environments besides smartphones in Indonesia.

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