Exploring The Factors Affecting Consumer Preparedness For Smart Home Technology In Indonesia

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Abstract.

Smart home technology is becoming more popular globally, including in Indonesia. However, its adoption is still early, mainly due to the public's limited awareness of this technology. This study uses the Technology Readiness and Acceptance Model (TRAM) to assess individuals' readiness to embrace smart home technology. This research was conducted using SEM PLS with 271 respondents selected through purposive sampling, using 34 questions with a 5-point Likert scale. Positive outlook and user-friendliness have a role in how people value smart home technology, according to the study's findings. Optimism, inventiveness, and discomfort all affect how easy something is to use. Anxiety and unease can play a role in how we interpret danger. Smart home technology adoption is influenced by factors such as its perceived value, simplicity of use, and cost significantly and positively.

Keywords: *Smart Home Technology, Technology Acceptance Model, Technology Readiness, Price Value, and Perceived Risk.*

I. INTRODUCTION

In recent years, the Internet of Things (IoT) has expanded the current Internet to various everyday objects and products (Basarir-Ozel et al., 2022). According to information from the Indonesian IoT forum, 400 million sensor devices have been used in Indonesia that have been integrated with IoT. Its usage is predominantly in the manufacturing sector, accounting for 16%, with the remainder distributed across other sectors (Indotelko, 2020). Smart Home is one of the various IoT technologies (Shin et al., 2018). A Smart Home combines household equipment with sensors connected to the home network, offering control services and providing various benefits such as financial, social, poverty, security, and health for its users (Marikyan et al., 2019). With smart home technology, homes are transforming into more competent and more integrated homes (Basarir-Ozel et al., 2022).Smart home technology development shows substantial growth, which can become a determining factor in the future's energy transition (Hargreaves et al., 2018; Ji and Chan, 2020). According to data from Statista, the number of smart home devices connected to IoT in Indonesia is estimated to reach 16.57 million users by 2027, with household penetration expected to reach 20.6% by the same year (Statista, n.d.). Furthermore, Indonesia boasts Southeast Asia's most significant potential market, a target for many foreign players, driven by its technological advancement and demographic size (Lairan, 2022). However, if we look at the adoption of smart home devices in Indonesia. Device ownership is still below other Southeast Asian countries. As of 2021, smart device ownership in Indonesia stood at 5.7%, Malaysia had 7.2%, Singapore had 11.30%, and Vietnam had 14.2% of the population with smart home devices.

These percentages indicate that Indonesia has the lowest adoption rate among several other countries until 2023.Regulatory issues regarding ownership of smart home technology itself are an obstacle to adopting it in Indonesia. Specific IoT devices lack universal regulatory clarity, requiring developers and manufacturers to formulate policies (Rudiansyah, 2022). In contrast, for smartphones, the government applies IMEI rules to control illegal devices. This allowlist scheme is a preventive process for IMEI control to ensure the legality of devices before purchase (Jamaludin, 2020). Additionally, the relatively higher cost of smart home technology makes its use inaccessible to the entire population. It leads to social stratification, where higher-income people have easier access to more advanced products (Noer, 2021).Furthermore, due to the internet connectivity of smart homes, security and privacy are of paramount concern. There is a potential risk of cyber attacks, hacking, and unwanted data collection. Consequently, consumers still consider the privacy of data collected by smart home devices and seek clear and transparent privacy policies. Smart homes also involve various devices with diverse technologies, creating a challenge in ensuring compatibility for seamless communication. Moreover, sustainability depends on adopting widely accepted standards by the industry, facilitating integration and future development of smart home systems (Moses, 2023).Considering the background above, it is evident that Indonesia's potential smart home market is high, but several factors inhibit its adoption.

Several researchers have discussed smart home technology by examining users' technology acceptance. Researchers using the Technology Acceptance Model (TAM) include Elian and Salehudin (2022), Gu et al. (2019), Mashal et al. (2020), Park et al. (201)8; Shuhaiber & Mashal (2019), Zhang and Liu, (2022). Several researchers have used the UTAUT 2 Model to look at the individual acceptance of smart home technology; researchers using UTAUT2 include Aldossari and Sidorova (2020), Sequeiros et al. (2021) and Baudier et al. (2020).Most research focuses on the context of technology adoption but does not explore individual readiness factors in using smart home technology. So, there is a research gap with previous research. Therefore, individual technological readiness also needs to be studied further. Research on technology readiness, as conducted by (J. et al., 2011), Considers that smart home technology is a concept that has only recently developed in Indonesia since changes in individual behavior occurred during the pandemic. So, studying the phenomenon of smart home technology in Indonesia makes it a catchy topic to research.Researchers in this study attempted to gauge how open the Indonesian public was to adopting smart home technology. Parasuraman's Technology Readiness Index (TRI) uses optimism, inventiveness, insecurity, and discomfort. 2015 (Parasuraman, Colby). Fred Davis' 1989 acceptance model (TAM) includes perceived usefulness, ease of use, and desire to use. (Wicaksono, 2022). Researchers also tried to extract the model by adding risk perception and price value where risk hurts intentions to use technology, while price value has the opposite effect.

II. LITERATURE REVIEW

Smart Home Technology (SHT)

Smart home technology is equated with home automation, home networking, and digital or smart home. (Yang et al., 2018). where this technology allows home devices to be connected digitally. So homeowners can monitor and control home use regarding automation, energy use, and other aspects (Sovacool & Furszyfer Del Rio, 2020).

Technology Readiness and Acceptance Model (TRAM)

A combined model of Technology Readiness and Acceptance. The testing of this model results in a substantially expanded application of TAM and enhances the explanatory power compared to earlier models, as outlined by (C. et al., 2007).

III. METHODS

This study is a reiteration of others' investigations into the TR Index and the TAM. In this study, researchers in Indonesia are interested in gauging people's openness to and preparedness for adopting smart home technologies. The evaluation rubric was constructed with input from experts in the field of technology adoption and readiness. (Mulcahy et al., 2019; Shuhaiber and Mashal, 2019).The data underwent analysis using the Smart PLS software version 3.4. Researchers conducted an online survey (Google Form) to carry out research. The questionnaire consisted of three parts. Part 1 included screening questions to select participants who met the criteria, i.e., those who were knowledgeable about smart home technology and had access to the necessary devices for using smart home technology, such as smartphones or tablets. Part 2 collects demographic information from the questionnaire results in name, gender, age, education, occupation, and monthly income. Section 3 contains 34 research questions with answer choices in a 5-point Likert scale. (see Figure 1).

Research Hypotheses

Based on the description and data presented above, the hypothesis in this research is as follows:

- ✓ H1: Optimism has a significant positive impact on the Perceived Ease of Use of smart home technology.
- ✓ H2: Optimism has a significant positive impact on the Perceived Effectiveness of smart home technology.
- ✓ H3: Optimism significantly negatively impacts the Perceived Risk of smart home technology.
- ✓ H4: Innovativeness has a significant favorable influence on the Perceived Ease of Use of smart home technology.
- ✓ H5: Innovativeness has a significant favorable influence on the Perceived Usefulness of smart home technology.
- ✓ H6: Innovativeness significantly negatively influences the Perceived Risk of smart home technology.
- ✓ H7: Insecurity significantly negatively affects the perceived ease of use of smart home technology.
- ✓ H8: Insecurity significantly negatively affects the perceived usefulness of smart home technology.
- ✓ H9: Insecurity has a significant positive effect on the perceived risk of smart home technology.
- ✓ H10: Discomfort significantly negatively affects the perceived ease of use of smart home technology.
- ✓ H11: Discomfort significantly negatively affects the perceived benefits of smart home technology.
- ✓ H12: Discomfort has a significant positive effect on the perceived risk of smart home technology.
- ✓ H13: Perceived Ease of Use is significantly positively related to the perceived usefulness of smart home technology.
- ✓ H14: Perceived Ease of Use is positively and significantly related to the intention to use Smart Home technology.
- ✓ 15: Perceived usefulness positively influences the intention to use smart home technology.
- ✓ H16: Perceived risk has a significant adverse effect on the Use Intention of smart home technology.
- ✓ H17: Price Value Has a Significant Positive Effect on Interest in Using Smart Home Technology.

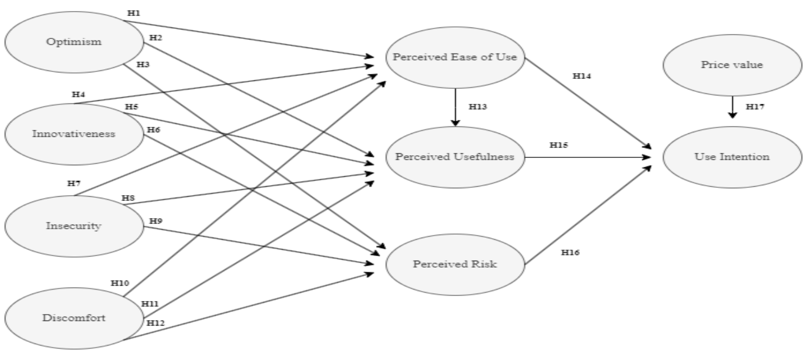

Fig 1. Empirical Research Models

IV. RESULT AND DISCUSSION

Respondent Demographic Profile.

Two hundred seventy-one individuals participated in this study. Of the total respondents, 66% (n=178) were females, and 34% (n=93) were males. The majority held a bachelor's degree (51%), were aged between 17-25 years (49%), and worked in the private sector (41%), with monthly income ranging from IDR 1,000,001 to IDR 5,000,000, 58% of the total number of respondents.

Reliability and Validity Analysis

Evaluation of the measurement model, or what is usually called the outer model, is the first step in model evaluation. The outer model evaluation consists of a construct validity test (Hamid and Anwar, 2019). In addition to validity testing, internal consistency reliability testing is conducted.The metrics used to evaluate convergent construct validity are seen from factor loading values with criteria ranging from 0.6 to 0.7 for exploratory studies where AVE values below 0.50 are considered respectable. Ghozali & Latan (2015) & Hair Jr et al., (2021). Cronbach's alpha and composite values can be used to measure the degree of internal consistency, with the minimum recommended reliability coefficient value being Rho 0.70 or 0.60 for exploratory research, and the most recommended value is between 0.80 and 0.90 (Hair Jr et al., 2021) (see

Table 1). If the square root of two constructs' AVE is larger than their connection, discriminant validity is valid. (Indrawati, 2015) (see Table 2).

Hypothesis test

After calculating the measurement model, we move on to analyzing the inner model, or what is usually called the structural model. Hypothesis testing can be seen in Table 3.

Table 1. Measures of Validity and Reliability of Variables

Variable	Item	Nilai Loading Factor	AVE	Cronbach's Alpha	Composite reliability
Optimism	OP1	0.917	0.789	0.911	0.937
	OP2	0.913			
	OP3	0.847			
	OP4	0.874			
Innovativeness	INN1	0.854	0.748	0.833	0.899
	INN2	0.888			
	INN3	0.853			
Insecurity	ISC1	0.843	0.623	0.712	0.830
	ISC2	0.861			
	ISC3	0.647			
Discomfort	DIS1	0.868	0.675	0.844	0.892
	DIS2	0.759			
	DIS3	0.804			
	DIS4	0.850			
Perceived Ease of Use	PEoU1	0.880	0.815	0.924	0.946
	PEoU2	0.910			
	PEoU3	0.918			
	PEoU4	0.903			
Perceived Usefulness	PU1	0.824	0.715	0.900	0.926
	PU2	0.795			
	PU3	0.863			
	PU4	0.861			
	PU5	0.882			
Perceived Risk	PR1	0.909	0.849	0.941	0.958
	PR2	0.943			
	PR3	0.897			
	PR4	0.937			
Price Value	PV1	0.875	0.850	0.911	0.944
	PV2	0.942			
	PV3	0.947			
Use Intention	UI1	0.851	0.804	0.919	0.943
	UI2	0.922			
	UI3	0.911			
	UI4	0.902			

Table 2. Discriminant Validity Value

	DIS	INN	ISC	OPT	PEoU	PR	PU	PV	UI
DIS	0.822								
INN	.094	0.865							
ISC	0.428	0.352	0.790						
OPT	0.109	0.586	0.345	0.888					
PEoU	0.023	0.528	0.320	0.536	0.903				
PR	0.402	0.099	0.483	0.117	0.245	0.922			
PU	0.051	0.495	0.301	0.576	0.804	0.230	0.846		
PV	0.033	0.545	0.248	0.372	0.606	0.080	0.556	0.922	
UI	0.012	0.584	0.268	0.488	0.743	0.181	0.722	0.716	0.897

Table. 3. Hypothesis Testing Results

Hypothesis Relationship		Original sample (O)	T statistics (|O/STDEV|)	P-Value	Hypothesis Test Results
H1	OPT → PEoU	0.323	4.028	0.000	Supported
H2	OPT → PU	0.195	3.405	0.000	Supported

H3	OPT → PR	-0.015	0.190	0.425	Rejected
H4	INN → PEoU	0.296	4.259	0.000	Supported
H5	INN → PU	0.015	0.288	0.387	Rejected
H6	INN→ PR	-0.058	0.894	0.186	Rejected
H7	ISC → PEoU	0.149	2.073	0.019	Rejected
H8	ISC → PU	0.003	0.056	0.478	Rejected
H9	ISC → PR	0.408	5.745	0.000	Supported
H10	DIS → PEoU	-0.104	1.846	0.032	Supported
H11	DIS → PU	0.012	0.314	0.377	Rejected
H12	DIS → PR	0.234	3.422	0.000	Supported
H13	PEoU → PU	0.691	12.004	0.000	Supported
H14	PEoU → UI	0.279	3.573	0.000	Supported
H15	PU → UI	0.276	3.462	0.000	Supported
H16	PR → UI	0.018	0.491	0.312	Rejected
H17	PV → UI	0.392	7.466	0.000	Supported

The structural model in SmartPLS provides support for a particular hypothesis, This standard analysis of coefficients and significance levels allows researchers to assess whether relationships between hypothesized variables have statistical support, which helps test research hypotheses.The results show that optimism about Smart Home Technology will positively impact Perceived Ease of Use (PEoU) with a coefficient of 4.028 and a significance level of p < 0.005, confirming hypothesis H1. Apart from having an impact on the ease of technology, a sense of optimism also has an impact on the benefits and uses of smart home technology. See the results of the coefficient of 3.405 and the significance level of p < 0.05. So, H2 is supported, confirming that Optimism (OPT) significantly positively affects Perceived Effectiveness (PU), which is different from before. The research results show that optimism does not significantly affect Perceived Risk (PR), as evidenced by the path estimate of 0.190 and a significance level of p > 0.05. Therefore, Hypothesis H3 is rejected.They are moving on to the influence of Innovativeness on the endogenous variable. Only one of the three proposed hypotheses is accepted: the significant positive impact of Innovativeness → PEoU (β 4.259, p < 0.005), supporting H4. Meanwhile, Innovativeness → PU (β 0.288, p > 0.005) and Innovativeness → PR (β 0.894, p > 0.005) do not have significant path estimates. Therefore, it can be concluded that Hypotheses H5 and H6 are not supported based on research findings.Regarding the relationship between Insecurity and PEoU, This has a significant positive impact (β 2.073, p < 0.005), although the proposed hypothesis suggests a significant negative relationship; thus, H7 is rejected. The Insecurity → PU research results show that the path estimate is insignificant (β 0.056, p > 0.05), indicating that Insecurity does not influence PU. Therefore, H8 is not supported. In contrast, Insecurity → PR has a significant positive correlation (β 5.745, p < 0.05), hence H9 is accepted

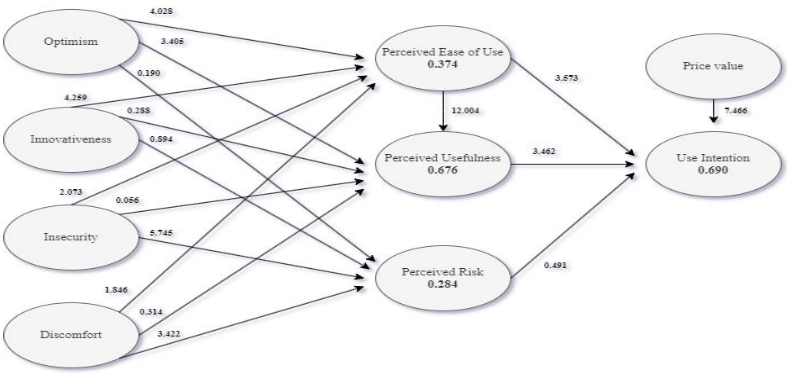

Fig 2. Structural Model Results

H10, H12 received from the effect of Discomfort → significant negative PEoU (β 1,846, p < 0.05), Discomfort → significant positive PR (β 3,422, p < 0.05). On the other hand, H11 is rejected because the path estimate is insignificant (β 0.314, p > 0.05). PEoU → PU and PEoU → UI have significant positive relationship results so that H13 and H14 are accepted. Once the relationship is PU → UI, PV UI → that contributes significant results, H15 and H17 are accepted. However, a different H16 is rejected (β 0.491, p > 0.05).

V. CONCLUSION

The hypothesis test results indicate that Innovativeness significantly and positively influences the Perceived Ease of Use of smart home technology. Someone open to technology will find smart home technology easy to use Chen and Lin, (2018) and Shi, (2018). However, unlike before, the relationship between innovation and perceived benefits is rejected. This statement implies no relationship or correlation between being innovative and perceiving benefits from smart home technology. There are several reasons why someone with a high level of innovation might not derive many benefits from smart home technology. This could be due to unmet expectations regarding the technology's features or other factors in its usage, as shown in the research conducted by (Chen and Lin, 2018; Kumar and Dami, 2021).According to Farzianpour et al. (2014) and Mulcahy et al. (2019), innovation did not significantly impact perceived risk. The absence of a significant relationship indicates that a person's level of innovativeness does not significantly influence their perception of the risks associated with using smart home technology. The results of testing the correlation between insecurity and perceived ease of use are not in line with the initial hypothesis proposed, so the hypothesis is rejected. This aligns with research by Godoe et al. (2012) and Nugroho and Andryzal Fajar (2017), which reject the negative influence between these two variables.There is an insignificant relationship between insecurity and perceived benefits, which can be interpreted as individuals who feel insecure about technology also tend to perceive its benefits. However, this difference in benefit perception is not statistically significant or consistent.

Factors like routine changes or fear of personal attacks can affect the perception of technology's benefits. Thus, individuals who tend to be uncomfortable will focus on the negative impacts related to that technology. This is consistent with the findings of (Erdoğmu and Esen, 2011; Nugroho and Andryzal Fajar, 2017).Related to the outcome of research conducted by Mulcahy et al. (2019) and Pradhan et al. (2018), insecurity significantly positively impacts risk perception. Perceived insecurity will likely increase users' perception of the risks associated with smart home technology. Insecurity can arise from various factors, such as concerns about personal data security, vulnerability to attacks or security breaches, or discussions about leaks or the stability of smart home technology. Because of this uncertainty, users may be more reluctant to use smart home technologies for fear of financial loss or other unintended repercussions. There is a strong inverse correlation between how uncomfortable something is and how easy it is to use, the less likely it is to use technology. Technology is something easy to use. Factors contributing to discomfort include a lack of technical support or user-friendly product manuals. This hinders technology adoption, as individuals may perceive the technology as challenging to learn or use. This aligns with recent research (Buyle et al., 2018; Kampa, 2023).The negative relationship between discomfort and perceived benefits does not affect each other. In this case, even if individuals feel uncomfortable interacting with smart home technology, they can still see the potential benefits of the technology. Factors that may render perceived benefits insignificant could include high costs or the perception that the benefits of the technology do not outweigh the discomfort.

Other variables may have a more significant influence on perceived usefulness. This aligns with previous studies conducted by (Erdoğmu and Esen, 2011; Nugroho and Andryzal Fajar, 2017).Discomfort has a significant positive relationship with risk perception. So, the higher the level of discomfort a person experiences, the greater the risk they feel. Discomfort can amplify risk perceptions, as the more difficult or uncomfortable someone is to operate a technology, the more likely they are to perceive potential risks in its use—this is by research conducted by Mulcahy et al. (2019) and Pradhan et al. (2018). A statistically positive relationship resulted from perceived usefulness and intention to use. When respondents realize the benefits of smart home technology in helping them do their work, they tend to intend to use it (Nafia et al., 2023; Shuhaiber and Mashal, 2019).There is a significant positive correlation between user friendliness and perceived value. When people find using technology to be simple, they are more likely to embrace it; they tend to feel pleased and confident exploring its features. This, in turn, can help their understanding of how technology can improve their lives. This finding is previous research that positively impacted the perceived ease of adopting new technology. People comfortable using technology tend to believe in its uses and benefits. (Cimbaljević et al., 2023; Kim and Chiu, 2019).

The hypothesis testing revealed a favorable and statistically significant connection between user friendliness and adoption prospects. Users' abilities and desires are matched by the convenience of technology in a smart home. User-friendly smart home technology can increase user involvement and interest, potentially creating a feeling of attachment or dependence. Homeowners capable of adapting to innovative smart home applications and understanding how to use them efficiently are more likely to explore additional smart home configurations. This ease can boost interest in using home automation systems or applications. This finding aligns with previous research conducted by (Ismail, 2016; Nafia et al., 2023).The insignificant results between perceived risk and use intention suggest that this relationship is not statistically strong enough to conclude that the two variables are related. In other words, even if individuals perceive technology as risky, differences in adoption intention are not statistically significant or consistent. Other factors, such as perceived benefits of the technology or other personal factors, may substantially impact technology adoption intention more than risk perception. These findings are by studies conducted by Keong et al. (2020) and Mulcahy et al. (2019), indicating that risk does not influence adoption intention.Value for money describes how a technology's cost compares to the benefits it offers. Consumers are more likely to adopt new technologies if they view those technologies as being worth the cost exceed the financial costs incurred (Indrawati et al., 2017; Putra and Ariyanti, 2013).

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