https://jurnal.universitasputrabangsa.ac.id/index.php/fokbis/index
ISSN: 2623-2480/ P-ISSN: 1693-5209

Factors Influencing the Intention to Use Private Autonomous Vehicles in Indonesia's Big Cities

Endang Nuriayani[1], Donny Ekaputra[2], Feny Fitria Afiani[3]
BINUS University Business School, Indonesia[1,2,3]
email: endang.nuriayani@binus.ac.id[1]

Article Information

History of Article:
Received March 13th 2024
Accepted June 25th 2024
Published July 3rd 2024

DOI:
10.32639/fokbis.v23i1.825

ABSTRACT

This research explored the factors influencing the intention to use Private Autonomous Vehicles (PAVs) in Indonesia's big cities. The Technology Acceptance Model (TAM) was employed as the theoretical framework due to its model explaining the adoption of new technologies. The study utilized a quantitative approach, employing a Google Form questionnaire to collect data from 315 respondents in Jakarta, Bogor, Depok, Tangerang, and Bekasi. The data were analyzed using PLS-SEM analysis. While previous studies focused on AV adoption in Indonesia, particularly shared AVs as public transportation, and overlooked the aspect of AV familiarity concerning private AV adoption, this research addressed these gaps. The study's novelty lies in including AV familiarity and facilitating conditions variables. The study found that safety, AV familiarity, and facilitating conditions significantly impacted the perceived usefulness and ease of use of AVs, while personal benefit and social influence did not. In conclusion, adapting marketing strategies to diverse user preferences, emphasizing safety in promotional materials, strengthening educational efforts, seeking government support for road improvements, and enhancing the perceived ease of use and usefulness are essential to fostering positive attitudes and intentions toward autonomous vehicle technology.

Keywords: Private Autonomous Vehicles; Intention to Use; Indonesia Big Cities

INTRODUCTION

The emergence of Autonomous Vehicles (AVs) has sparked widespread interest and debate in the transportation industry. As countries worldwide explore the feasibility of AV deployment, it is essential to understand the factors influencing the intention to use private AVs, particularly in big cities.

Self-driving cars have made a significant change in how we get around. A comprehensive study by the National Highway Traffic Safety Administration (NHTSA) showed that self-driving cars are much safer than those driven by people; they are ten times safer. This discovery is important because it could change our thoughts about safety and transportation. AV technology has witnessed significant advancements in recent years, leading to successful trials and pilot programs in various countries. In Indonesia, the government recently inaugurated

the trial for Indonesia's first autonomous electric vehicle at Q-Big BSD City. This milestone showcases the country's ambition to adopt AVs and highlights the need to examine the factors that shape their acceptance and usage in Indonesian urban settings. Despite significant advancements in AV technology, understanding the factors influencing individuals' intention to use private AVs in big cities, particularly in Indonesia, remains challenging because many researchers focus on shared or public autonomous vehicles. Therefore, the research problem revolves around investigating the factors influencing the individual intention to use Private Autonomous Vehicles (PAVs) in the context of major Indonesian cities.

In addition, previous research by Furinto et al. (2022) has shed light on the factors influencing the intention to use AVs in Indonesia. However, their study did not consider private AV adoption and AV familiarity context of PAV adoption as one of the variables. This limitation provides an opportunity for further investigation to understand better the factors that drive PAV adoption in different cities within Indonesia.

To address this research gap, our study adopts the Technology Acceptance Model (TAM) as its theoretical framework. TAM has a well-established history of examining individuals' acceptance and usage patterns regarding emerging technologies, including Autonomous Vehicles (AVs) (Davis, 1989). By leveraging TAM, our research aims to identify and thoroughly analyze the fundamental factors influencing the intention to use AVs within the context of prominent Indonesian metropolises.

The independent variables in this study include Perceived Usefulness, Perceived Ease of Use, Personal Benefit, Safety, Social Influence, and AV Familiarity. Based on previous research, most of those variables have been identified as crucial factors that impact individuals' intention to use AVs (Furinto et al., 2022). The dependent variable is the Intention to Use PAVs, representing individuals' willingness and inclination to utilize PAV technology in their daily commute.

Moreover, this research incorporates Attitude toward Using as a mediating variable. Attitude toward Using reflects individuals' overall evaluation and perception of AV technology, which is vital in shaping their intention to use (Venkatesh & Davis, 2000). Additionally, the facilitating condition is considered a moderating variable, influencing the strength and direction of the relationship between the independent and dependent variables (Venkatesh et al., 2003).

By exploring the factors that shape the intention to use PAVs in Indonesia's major cities, this research seeks to contribute to the existing body of knowledge on PAV adoption. The multi-city approach adopted in this study provides a unique perspective, allowing for a more comprehensive understanding of PAV adoption within the Indonesian context. The findings of this research are expected to be valuable for PAV deployment and technology adoption in urban areas, ultimately facilitating the successful integration of AVs into Indonesia's transportation system.

Research Gap

The prior research by Furinto et al. (2022) has given insightful findings on factors influencing the intention to use AVs in Indonesia; however, it has primarily focused on shared or public AV utilization, neglecting the nuances of private AV ownership and its distinct adoption hurdles such as supported facilities and insights about AV itself. Another study conducted by Sitinjak et al. (2023) discussed AV as public transport and did not explore the potential impact of individuals' familiarity with AV technology and its supported facilities. Consequently, a crucial knowledge gap persists in understanding the factors driving individuals' intention to use private AVs in major Indonesian cities. This study aims to bridge this gap by investigating how individual familiarity, facilitating condition, perceived usefulness, perceived ease of use,

personal benefits, safety concerns, and social influence on AV technology interplay to shape attitudes and ultimately influence the intention to use private AVs within the landscapes of Indonesia's urban environments.

LITERATURE REVIEW

In the literature review section, the researchers focus on breaking down theories to delve into the foundational framework and variables used in this study.

Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) is an information systems theory developed by Fred Davis in 1986. It has since served as a prominent framework for studying the adoption of new technologies. TAM suggests that a user's intention to use technology is influenced primarily by perceived usefulness and ease of use. This model posits that the intention to use a technology predicts adoption and usage behavior. We adhere to the TAM as our guiding theoretical framework in our research. TAM is frequently employed to comprehend and forecast how individuals perceive and embrace novel technologies. It asserts that perceived usefulness and ease of use influence an individual's inclination to adopt a particular technology.

Autonomous Vehicles (AV)

Autonomous vehicles (AVs) have surfaced as a groundbreaking innovation that can transform transportation systems completely. Researchers from diverse fields have shown considerable interest in advancing and introducing SDCs. A personal or private autonomous vehicle (PAV) is a vehicle that can function without human intervention yet remains under an individual's or household's ownership and operation (National Highway Traffic Safety Administration, 2023).

Various research endeavors have delved into the technological progress propelling autonomous vehicles (AVs). Cutting-edge sensor technologies such as LiDAR (Light Detection and Ranging), radar, and cameras have found widespread application in providing instantaneous awareness of the surrounding environment (Grau et al., 2018; Liu et al., 2019). LiDAR has gained prominence for its capability to create highly accurate and detailed 3D maps of the vicinity (Zhang et al., 2020). Machine learning algorithms, including deep neural networks, have been utilized to interpret sensor data and make precise real-time decisions (Bojarski et al., 2016). Convolutional neural networks (CNNs) have showcased impressive achievements in identifying objects and detecting lanes (Pan et al., 2020). The fusion of these technologies has significantly contributed to the evolution of resilient autonomous driving systems.

According to the Institute of Electrical and Electronics Engineers (IEEE), level 3 automated vehicles (AVs) debuted in 2020. These AVs can conduct specific driving tasks without human intervention, although the human driver must remain prepared to take control at any moment. The American National Standards Institute (ANSI) expanded on the six levels of automation initially defined by the Society of Automotive Engineers (SAE) to categorize AVs. These levels include:

1. Level 0: No driving automation.
2. Level 1: Driver assistance.
3. Level 2: Partial driving automation.
4. Level 3: Conditional driving automation.
5. Level 4: High driving automation.
6. Level 5: Full driving automation.

This study specifically investigated AV level 3 within Indonesia. One primary research focus has been ensuring the safety of Personal Autonomous Vehicles (PAVs). Numerous studies have examined the performance and dependability of AVs across various driving scenarios.

Personal Benefit

In the era of technology acceptance models, 'personal benefit' pertains to the perceived advantages an individual anticipates from utilizing a new technology. These benefits encompass tangible aspects, such as time or cost savings, and intangible elements, like heightened productivity or enhanced quality of life. Renowned experts in technology acceptance emphasize its significance in influencing users' choices to adopt and engage with novel technologies. For instance, Davis et al. (1989) advocated that personal benefit stands as a pivotal determinant of Perceived Usefulness (PU), a foundational construct within the Technology Acceptance Model (TAM).

Safety

Safety is a critical factor influencing PAV adoption. Individuals' perception of the safety of PAVs significantly impacts their intention to use them. Li et al. (2020) demonstrated that safety concerns were negatively associated with individuals' intention to use PAVs. Safety features, robust testing procedures, and effective risk communication can enhance individuals' confidence in PAV safety.

Social Influence

Social influence reflects the degree to which individuals perceive using PAVs as socially acceptable and normative within their social environment. When individuals perceive that others in their social circle accept and use AVs, they are more likely to adopt them. Chen et al. (2022) reviewed the existing literature on the topic and found that social influence is a significant factor in AV adoption.

AV Familiarity

AV familiarity refers to individuals' awareness and understanding of AV technology. Zhang et al. (2020) highlighted the importance of AV Familiarity in shaping individuals' intention to use AVs. Higher knowledge about AV technology is positively associated with a greater intention to use AVs.

The independent variables - Perceived Usefulness, Perceived Ease of Use, Personal Benefit, Safety, Social Influence, and AV Familiarity - play crucial roles in understanding the intention to use Private Autonomous Vehicles (PAVs) within the context of major cities in Indonesia. These variables will thoroughly examine their impact on the adoption of PAVs in urban settings. The study will also consider mediating and moderating variables to understand better how these independent variables relate to the dependent variable, thereby enhancing our understanding of this intricate relationship.

Facilitating Conditions

Facilitating condition refers to the degree to which PAVs are available and accessible in a particular city. Zhang et al. (2022) highlighted the significance of reducing conditions in influencing PAV adoption in Tangerang, Indonesia. As demonstrated by their study, when PAVs are readily available and integrated into the transportation system, individuals are more inclined to use them.

Perceived Usefulness

Perceived usefulness is a significant technology acceptance and adoption variable concerning Private Autonomous Vehicles (PAVs). It represents individuals' subjective evaluations of how PAVs could enhance their performance, productivity, effectiveness, or overall satisfaction in accomplishing specific tasks or objectives.

In summary, the independent variables - Perceived Usefulness, Perceived Ease of Use, Personal Benefit, Safety, Social Influence, and AV Familiarity - exert considerable influence on individuals' intentions to use PAVs within the urban landscapes of Indonesia. These variables draw support from previous research, including studies by Yang et al. (2019), Furinto et al. (2022), Zhang et al. (2020), and Li et al. (2020). Additionally, the mediating variable, attitude toward using, and the moderating variable, Facilitating Condition, as posited by Venkatesh and Davis (2000) and Venkatesh et al. (2003), significantly shape individuals' inclinations toward PAV adoption. By examining these variables, this research sheds light on the factors influencing PAV adoption and contributes to the existing body of knowledge in this field.

Perceived Ease of Use

Perceived Ease of Use denotes the extent to which individuals perceive using PAVs as effortless and user-friendly. In the Technology Acceptance Model (TAM) by Venkatesh et al. (2003), perceived ease of use is identified as a pivotal variable. When individuals perceive PAVs as easy to use, it notably influences the connection between the independent variables and the intention to use PAVs.

Attitude toward using

Attitude toward using refers to how individuals assess and perceive PAV usage of PAVs, encompassing their beliefs, emotions, and general attitude toward adopting PAV technology. These attitudes significantly influence individuals' inclination to use PAVs. As Venkatesh and Davis (2000) discovered, attitudes play a crucial role in the relationship between independent variables and the intention to use technology. A positive attitude toward PAVs amplifies the likelihood of individuals intending to use them.

Intention to Use

The dependent variable in this research, intention to use private autonomous vehicles (PAVs), represents individuals' behavioral inclination or willingness to adopt and utilize AV technology in their transportation choices (Zhu et al., 2022). It reflects their expressed or anticipated future behavior regarding the use of PAVs. Intention to use is an essential construct as it serves as a predictor of actual behavior and adoption.

Theoretical Framework

According to the TAM model, perceived usefulness and ease of use collectively establish users' attitudes toward technology. These attitudes subsequently impact their behavioral intentions to adopt and utilize it. The model indicates that favorable attitudes are more likely to increase intentions to use the technology. Therefore, here is our proposed research model.

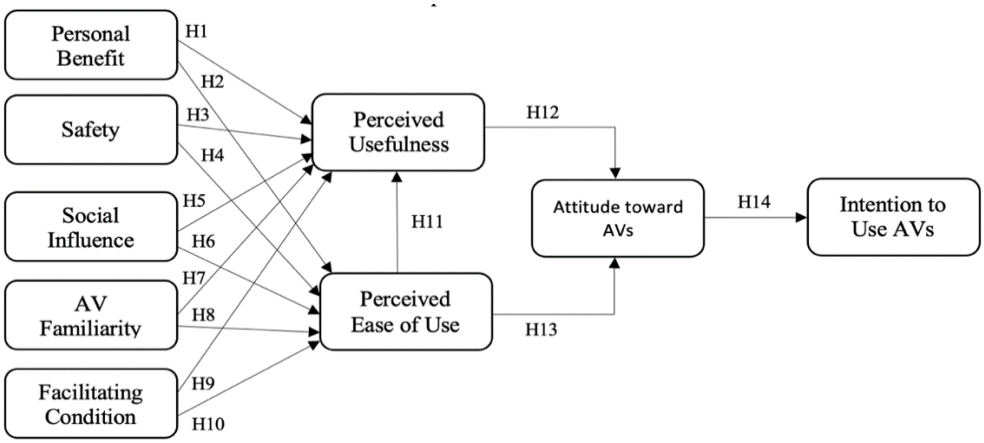

Figure 1. The Proposed Research Model

The researchers developed the relationships among variables following the TAM theory as the primary construct model. The hypotheses are presented as follows:

H_1: Personal Benefit (PB) positively influences Perceived Usefulness (PU).
H_2: Personal Benefit (PB) positively influences Perceived ease of use (PEOU).
H_3: Safety (S) positively influences Perceived Usefulness (PU).
H_4: Safety (S) positively influences Perceived ease of use (PEOU).
H_5: Social Influence (SI) positively influences Perceived Usefulness (PU).
H_6: Social Influence (SI) positively influences Perceived ease of use (PEOU).
H_7: AV Familiarity (AF) positively influences Perceived Usefulness (PU).
H_8: AV Familiarity (AF) positively influences Perceived ease of use (PEOU).
H_9: Facilitating Condition (FC) positively or negatively influences and moderates Perceived Usefulness (PU)
H_{10}: Facilitating Condition positively or negatively influences and moderates Perceived ease of use (PEOU)
H_{11}: Perceived ease of use (PEOU) positively influences Perceived Usefulness (PU).
H_{12}: Perceived Usefulness (PU) positively influences attitude toward using (ATU).
H_{13}: Perceived ease of use (PEOU) positively influences attitude toward using (ATU).
H_{14}: Attitude toward using (ATU) positively or negatively influences and mediates the intention to use (ITU).

METHODOLOGY

This study applied the Technology Acceptance Model (TAM) as the theoretical framework to investigate the factors influencing the intention to use Autonomous Vehicles (AVs) in big cities in Indonesia. The research design involved a quantitative method to collect data from participants.

Participants

The study selected participants from major cities in Indonesia, including Jakarta, Bogor, Depok, Tangerang, and Bekasi. The sample consisted of diverse individuals, considering age, gender, occupation, income, and familiarity with AV technology. The participants were chosen using Random Sampling, ensuring a representative population of interest and an appropriate sample size. Based on the data obtained, 315 respondents were selected as the sample of this study.

Techniques and Tools of Data Collection

The primary data collection method was a structured questionnaire based on the variables identified in the TAM. The questionnaire was administered online using a Google Form. The questionnaire was designed to measure the independent variables (Perceived Ease of Use, Perceived Usefulness, Personal Benefit, Safety, Social Influence, and AV Familiarity), the mediating variable (Attitude toward using), the moderating variable (Facilitating Condition), and the dependent variable (Intention to use). Likert scale (1: Strongly disagree to 5: Strongly agree) was used to capture participants' responses, allowing them to rate their agreement or disagreement on a scale. The questionnaire also included demographic questions to gather information about participants' characteristics.

Data Analysis

In this data analysis section, the researchers discuss the methodology and the analysis used in this research.

Descriptive Statistics

Descriptive statistics were used to summarize the demographic characteristics of the participants, including their age, gender, occupation, and level of familiarity with AV technology. This analysis provided an overview of the sample characteristics.

Validity and Reliability Analysis

The validity and reliability of the measurement scales used in the questionnaire were assessed using the Smart-PLS 4 Application. This analysis ensured the reliability of the data collected. PLS-SEM analysis was employed to examine the relationships among the variables (Hair, 2019). That analysis was conducted to assess the influence of the independent variables (Perceived Ease of Use, Perceived Usefulness, Personal Benefit, Safety, Social Influence, and AV Familiarity) on the dependent variable (Intention to use) (Venkatesh et al., 2003). The mediating variable (Attitude toward using) and moderating variable (Facilitating Condition) were also incorporated into the analysis to assess their impact on the relationships for a more comprehensive analysis.

RESULT AND DISCUSSION

The section on findings and discussion addresses the data collection methods and hypothesis testing. The subsequent information that relates to this paper is presented in the following sections.

Result

Demographic Data

This research data was obtained by administering online Google Forms to potential respondents using a random sampling method. The researchers collected demographic data that indicated gender, age, education, occupation, income levels, geographical locations in Indonesia, and their potential interest in purchasing autonomous vehicles.

Table 1. Respondent Profiles

Characteristics	Indicators	Frequency (n = 315)	Proportion (%)
Gender	*Male*	*183*	*58.1*
	Female	*132*	*41.9*
Age	*21-24*	*49*	*15.6*
	25-34	*106*	*33.7*
	35-44	*93*	*29.5*
	45-54	*52*	*16*
	>55	*15*	*4.8*
Highest Education Level	*Not a Diploma/Bachelor's*	*57*	*18.1*
	Diploma/Bachelor's (S1)	*221*	*70.2*
	Master's (S2) or higher	*37*	*11.7*
Current Occupation	*Private Employee*	*189*	*60*
	State-Owned Enterprises Employee	*30*	*9.5*
	Civil Servant / Military / Police	*21*	*6.7*
	Entrepreneur / Business	*51*	*16.2*

Characteristics	Indicators	Frequency (n = 315)	Proportion (%)
	Owner		
	Retiree	*9*	*2.9*
	Others	*15*	*4.7*
Monthly Income	*< IDR 50.000.000*	*218*	*69.2*
	IDR 51.000.000 – IDR 100.000.000	*57*	*18.1*
	IDR 101.000.000 – IDR 200.000.000	*27*	*8.6*
	> IDR 201.000.000	*13*	*4.1*
Current City of Residence	*Jakarta*	*48*	*15.2*
	Bogor	*55*	*17.5*
	Depok	*67*	*21.3*
	Tangerang	*80*	*25.4*
	Bekasi	*50*	*15.9*
	Others	*15*	*4.7*
Budget for Purchasing Autonomous Vehicles	*< IDR 300.000.000*	*190*	*60.3*
	IDR 301.000.000 - IDR 500.000.000	*87*	*27.6*
	IDR 501.000.000 - IDR 600.000.000	*27*	*8.6*

Source: Data collected

This table represents the participants' demographic characteristics, indicators, frequencies, and proportions, providing a clear and structured overview of the obtained data. Furthermore, the research findings revealed a diverse representation among 315 participants, with a higher proportion of males (58.1%) than females (41.9%). The majority of participants were within the age brackets of 25-34 (33.7%) and 35-44 (29.5%), while a smaller percentage fell within the over-55 category (4.8%). Regarding education, a significant majority (70.2%) held a Diploma/Bachelor's degree (S1), while 11.7% pursued education beyond this level. Private employment emerged as the primary occupation (60%), followed by entrepreneurs/business owners (16.2%). Regarding income, most earned less than IDR 50.000.000 monthly (69.2%). Tangerang was the most represented city of residence (25.4%), and 60.3% of participants had a budget of less than IDR 300.000.000 for purchasing autonomous vehicles, with a smaller fraction willing to spend higher amounts.

Validity Constructs

In the assessment of model reliability, Smart-PLS 4 was employed. Following the initial analysis, three indicators associated with two variables were omitted from the final dataset due to their validity values falling below the recommended threshold of 0.7 (as per the guidelines of Hair et al., 2010). The PLS-SEM Algorithm was done to check the questionnaires' validity and reliability contracts, and the obtained table is as follows:

Table 2. Outer Loading (λ)

Questionnaire	AV Familiarity	Attitude toward Using	Facilitating Condition	Intention to Use	Perceived Ease of Use	Perceived Usefulness	Personal Benefit	Safety	Social Influence
AF01	0,770								
AF02	0,706								
AF03	0,807								
AF04	0,825								
AF05	0,808								
ATU01		0,843							
ATU02		0,831							
ATU03		0,837							

Questionnaire	AV Familiarity	Attitude toward Using	Facilitating Condition	Intention to Use	Perceived Ease of Use	Perceived Usefulness	Personal Benefit	Safety	Social Influence
FC01			0,751						
FC02			0,793						
FC03			0,756						
FC04			0,741						
FC05			0,741						
ITU01				0,783					
ITU02				0,851					
ITU03				0,835					
PB01							0,791		
PB02							0,780		
PB03							0,794		
PB04							0,797		
PEOU01					0,759				
PEOU02					0,807				
PEOU03					0,802				
PEOU04					0,800				
PEOU05					0,776				
PU01						0,773			
PU02						0,646			
PU03						0,777			
PU04						0,763			
PU05						0,769			
S01								0,804	
S02								0,822	
S03								0,850	
S04								0,653	
S05								0,656	
SI01									0,766
SI02									0,745
SI03									0,759
SI04									0,781

Source: Primary data processed

Three items of the questionaries were omitted in the variable Safety (S04:0.653 and S05:0.656) in the variable Perceived Usefulness (PU02:0.646). After excluding those three indicators, resulting in a total of 36 remaining indicators, the model was reanalyzed using the same parameters. The outcomes of this subsequent analysis are detailed in the following table.

Table 3. Validity and Reliability Constructs

	Code	*λ*	*Cronbach's alpha*	*Composite reliability (rho_a)*	*Composite reliability (rho_c)*	*Average variance extracted (AVE)*
AV Familiarity	*AF01*	*0,772*	*0,843*	*0,849*	*0,888*	*0,615*
	AF02	*0,705*				
	AF03	*0,806*				
	AF04	*0,825*				
	AF05	*0,808*				
Attitude toward Using	*ATU01*	*0,842*	*0,786*	*0,788*	*0,875*	*0,700*
	ATU01	*0,830*				
	ATU01	*0,838*				
Facilitating Condition	*FC01*	*0,751*	*0,814*	*0,820*	*0,870*	*0,573*
	FC02	*0,793*				
	FC03	*0,759*				
	FC04	*0,741*				
	FC05	*0,739*				
Intention to Use	*ITU01*	*0,783*	*0,763*	*0,767*	*0,863*	*0,678*

	Code	*λ*	*Cronbach's alpha*	*Composite reliability (rho_a)*	*Composite reliability (rho_c)*	*Average variance extracted (AVE)*
	ITU02	*0,851*				
	ITU03	*0,835*				
Perceived Ease of Use	*PEOU01*	*0,759*	*0,848*	*0,849*	*0,892*	*0,623*
	PEOU02	*0,806*				
	PEOU03	*0,802*				
	PEOU04	*0,800*				
	PEOU05	*0,777*				
Perceived Usefulness	*PU01*	*0,787*	*0,795*	*0,797*	*0,867*	*0,619*
	PU03	*0,767*				
	PU04	*0,786*				
	PU05	*0,807*				
Personal Benefit	*PB01*	*0,804*	*0,816*	*0,907*	*0,867*	*0,620*
	PB02	*0,774*				
	PB03	*0,784*				
	PB04	*0,787*				
Safety	*S01*	*0,855*	*0,857*	*0,860*	*0,913*	*0,777*
	S02	*0,885*				
	S03	*0,904*				
Social Influence	*SI01*	*0,765*	*0,761*	*0,762*	*0,848*	*0,582*
	SI02	*0,748*				
	SI03	*0,757*				
	SI04	*0,781*				

Source: Primary data processed

This table presents the evaluation metrics related to outer Loading Cronbach's alpha, composite reliability (rho_a), composite reliability (rho_c), and average variance extracted (AVE) for each construct. The evaluation of the measurement models involved a comprehensive analysis focusing on two key aspects: convergent validity and internal consistency reliability. Concurrent validity, which indicates how well multiple measures of the same construct align, was assessed by examining outer loadings. These external loadings represent the relationship between the indicators and their shared construct. A generally accepted criterion for Average variance extracted (AVE) is an outer loading of 0.5 or higher, while indicators falling below this threshold are considered for exclusion (Chin, 1998; Hair et al., 2010).

Upon reviewing the findings in Table 3, all indicators demonstrated outer loading values for AVE exceeding the 0.5 benchmarks, indicating their alignment with the underlying construct and, therefore, were retained for further analysis. The internal consistency reliability was assessed using Cronbach's alpha, a statistical measure determining how well different items measuring the same construct produce consistent results. Traditionally, a Cronbach's alpha value greater than 0.7 indicates internal solid consistency reliability (Hair et al., 2019).

As per the results tabulated in Table 3, all variables examined exhibited Cronbach's alpha values surpassing the 0.7 threshold. This suggests that the measures used in this study consistently align and are reliable in assessing the intended construct.

Discriminant Validity

Table 4. Fornell-Larcker Discriminant Validity

Variable	AV Familiarity	Attitude toward Using	Facilitating Condition	Intention to Use	Perceived Ease of Use	Perceived Usefulness	Personal Benefit	Safety	Social Influence
AV Familiarity	**0,784**								
Attitude toward Using	0,494	**0,837**							
Facilitating Condition	0,288	0,660	**0,757**						
Intention to Use	0,573	0,699	0,613	**0,823**					
Perceived Ease of Use	0,644	0,696	0,597	0,724	**0,789**				
Perceived Usefulness	0,660	0,688	0,539	0,700	0,756	**0,787**			
Personal Benefit	0,031	0,177	0,249	0,143	0,144	0,125	**0,787**		
Safety	0,491	0,519	0,339	0,547	0,585	0,592	0,128	**0,882**	
Social Influence	0,436	0,570	0,579	0,586	0,564	0,543	0,217	0,485	**0,763**

Source: Primary data collected

The test for discriminant validity was conducted using the Fornell-Larcker criterion. The results from Table 4 show that each variable mostly correlates strongly with itself. It can be seen from all items that they are valid as measurement tools.

Hypothesis Testing

The conceptual model we suggested was examined through structural equation modeling. The model's overall fit is considered satisfactory because the goodness of fit statistics indicates values exceeding generally accepted standards. The following sections will support and explain each hypothesis based on the results. These specific results are detailed in Table 5 and visually represented in Figure 2.

Table 5. Hypothesis Testing Result

Hypothesis Path	*Standard deviation (STDEV)*	*T statistics (O/STDEV)*	*P values*	*Decision*
AV Familiarity -> Perceived Ease of Use	*0,053*	*7,380*	***0,000***	*Supported*
AV Familiarity -> Perceived Usefulness	*0,058*	*4,899*	***0,000***	*Supported*
Attitude toward Using -> Intention to Use	*0,038*	*18,420*	***0,000***	*Supported*
Facilitating condition -> Perceived Ease of Use	*0,065*	*5,579*	***0,000***	*Supported*
Facilitating condition -> Perceived Usefulness	*0,059*	*2,856*	***0,004***	*Supported*
Perceived Ease of Use -> Attitude toward Using	*0,092*	*4,462*	***0,000***	*Supported*
Perceived Ease of Use -> Perceived Usefulness	*0,069*	*5,066*	***0,000***	*Supported*
Perceived usefulness -> Attitude toward Using	*0,087*	*4,348*	***0,000***	*Supported*
Personal benefit -> Perceived Ease of Use	*0,041*	*0,089*	***0,929***	*Rejected*
Personal benefit -> Perceived Usefulness	*0,043*	*0,180*	***0,857***	*Rejected*
Safety -> Perceived Ease of Use	*0,065*	*3,637*	***0,000***	*Supported*
Safety -> Perceived Usefulness	*0,048*	*3,584*	***0,000***	*Supported*
Social influence -> Perceived Ease of Use	*0,069*	*0,983*	***0,326***	*Rejected*
Social influence -> Perceived Usefulness	*0,074*	*0,583*	***0,560***	*Rejected*

Source: Primary data collected

The model's overall adequacy is indicated by goodness-of-fit statistics that surpass commonly accepted thresholds. In the subsequent sections, each hypothesis was validated based on the outcomes obtained, visually presented in Figure 2.

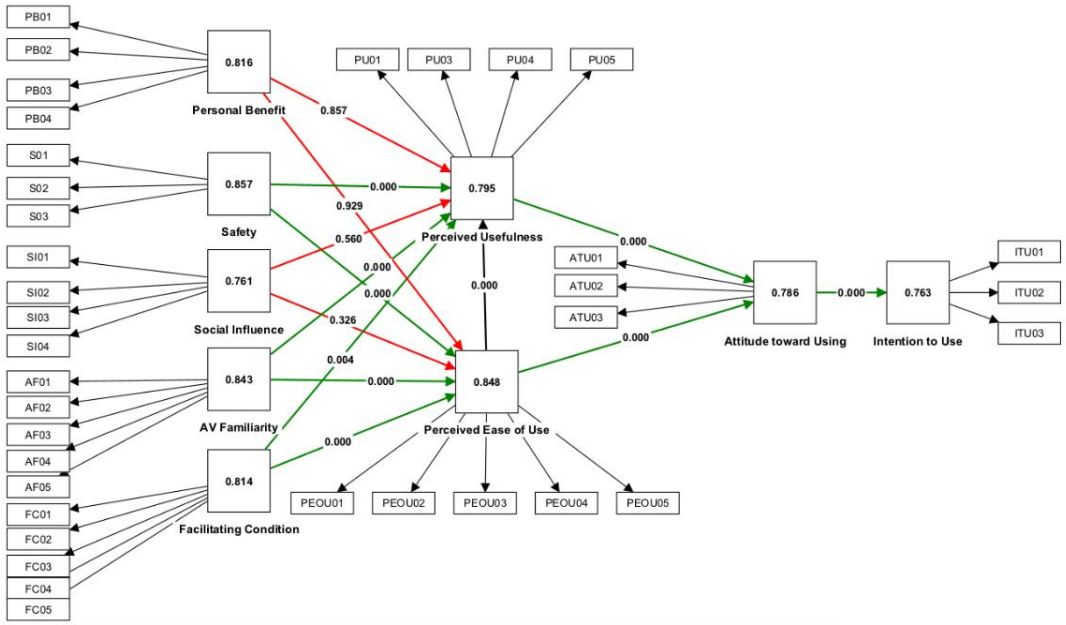

Figure 2. Research Model Hypothesis Testing

Discussion

The presented figure brings information on the p-value as the inner model and Cronbach Alpha as the contract. After finishing our data analysis, we decided to dig deeper into the rejected hypotheses. By focusing on these rejected hypotheses, we expect to find hidden insights and learn more about our data:

H_1: Personal Benefit (PB) positively influences Perceived Usefulness (PU).
H_2: Personal Benefit (PB) positively influences Perceived ease of use (PEOU).

Both presented hypotheses showed non-significant results, with p-values of 0.857 and 0.929, respectively. These findings indicate insufficient evidence to support the proposed hypotheses, suggesting weak or non-significant relationships among the variables. The questionnaire data, especially for *"I can sleep while driving in an autonomous vehicle,"* showed that over 60% of the respondents chose to be neutral and disagree because most individuals may prefer to remain alert and in control while driving, even if the technology is available. This preference for maintaining control could influence their response towards disagreeing with the statement. To elaborate, Bansal et al. (2016) found that the most significant personal benefit of AV usage was the ability to enjoy the view along the AV route. This suggests that individuals may be more interested in the leisure-related benefits of AVs than in the utilization benefits. It was also proven by the prior study conducted by Furinto et al. (2022), which found that the hypothesis was also rejected.

Moreover, the questionnaire item *"I can watch movies or play games while driving in an autonomous vehicle"* showed that almost 50% of the respondents were neutral and disagreed with the statement. This indicates that some individuals are concerned about the potential risks associated with distracted driving, even in the context of autonomous vehicles. The previous study showed that users predominantly associate AVs with leisure-related trips (Manfreda et al., 2018). These results differed due to the participants' samples in earlier studies regarding age, gender, driving experience, or other factors. These factors could influence participants' attitudes toward self-driving cars and their willingness to surrender

control while driving a private AV. Therefore, based on our findings, it can be inferred that most of the respondents in this study did not exhibit a strong direct correlation between Personal Benefit and perceived usefulness or ease of use.

H_5: Social Influence (SI) positively influences Perceived Usefulness (PU).
H_6: Social Influence (SI) positively influences Perceived ease of use (PEOU).

The study's findings led to the rejection of hypotheses 5 and 6, indicating that the social influence of PAVs did not significantly impact the perceived usefulness or ease of use with p-values 0.560 and 0.326. Moreover, the data also showed that most respondents believed that the Social Influence of PAVs did not influence their perceptions of the vehicle's usefulness and ease of use. However, this contrasts with research by Barth et al. (2016), which demonstrated that social influence had significant effects, sometimes even more potent than cost-related factors, in the initial stages of electric vehicle adoption. Similarly, a study by Van der Heijden et al. (2017) found that social influence significantly affected people's attitudes towards Avs.

It is crucial to highlight that our findings are different and potentially influenced by diverse settings and respondent characteristics. For instance, cultural factors might play a role, with some societies placing greater importance on input from friends and family in decisions related to technology adoption. Notably, most of our study respondents pursue higher education, such as Bachelor's and Master's Degrees. We hypothesized that this group relies more on personal critical opinion rather than being influenced by external influences. Our research indicates that Social Influence does not significantly impact our respondents' intentions to use PAVs.

CONCLUSION

This study investigated factors influencing the intention to use Private Autonomous Vehicles (PAVs) in big cities in Indonesia, focusing on the moderating role of facilitating conditions. The findings of the study reveal that safety, AV familiarity, and facilitating conditions significantly impact the perceived usefulness and ease of use of AVs, while personal benefit and social influence do not. In short, this addresses a notable gap in our research, highlighting the significance of AV familiarity and facilitating conditions as crucial factors influencing individuals' intention to use Private Autonomous Vehicles. In addition, the H3, H4, H7, H8, H9 and H10 were accepted while H1, H2, H5 and H6 were rejected. Additionally, perceived ease of use and perceived usefulness positively influence attitudes toward using AVs, which, in turn, mediates the intention to use AVs. This means, H11, H12, H13 and H14 were accepted. Overall, this study provides valuable insights into the factors influencing the acceptance and adoption of PAVs in Indonesia's big cities.

The findings suggest several managerial implications that need to be considered, such as for managers, manufacturers, and policymakers to keep in mind. They should consider different user preferences and adjust their marketing strategies to meet diverse user needs. Instead of focusing on social influence in awareness campaigns, they should consider other factors like safety and convenience. It is crucial to highlight safety features in promotional materials and campaigns about AV. Educational efforts should be strengthened, including using AV simulators and providing easy-to-understand instructional materials, which AV agents or car dealers could offer. Seeking government support for road improvements, such as adding more traffic signs, can enhance overall road perception and practicality. Additionally, improving the perceived ease of use and usefulness can help create positive attitudes and intentions toward the technology.

Moreover, the researchers also suggested conducting a longitudinal study to track changes in people's attitudes and intentions over time. This would allow future researchers to determine whether the factors influencing the intention to use PAVs change as the technology becomes more mature and widely adopted. It is also recommended that a cross-cultural study be conducted to compare the factors influencing the intention to use PAVs in different countries and cultures. This would help identify the most critical factors for PAV adoption across different contexts.

REFERENCES

Bansal, P., Kockelman, K. M., & Singh, A. (2016). Assessing public opinions of and interest in new vehicle technologies: An Austin perspective. *Transportation Research Part C: Emerging Technologies, 67*, 1–14. https://doi.org/10.1016/j.trc.2016.01.019

Barth, M., Shaheen, S., & Todd, A. (2016). Social influence on electric vehicle adoption: A study of the United States. *Transportation Research Part D: Transport and Environment, 45*, 1-12.

Bojarski, M., Del Testa, D., D'Amour, D., Jack, T., Levine, P., Muller, P. G., & Petrov, B. (2016). End-to-end learning for autonomous driving. In *Proceedings of the IEEE International Conference on Robotics and Automation (ICRA)* (pp. 5492-5498). IEEE.

Chen, F., Ma, Y., Guo, L., & Zhao, W. (2022). Opportunities and challenges of autonomous vehicles in rural areas: A case study of China. *Journal of Transport Geography, 95*, 103129.

Chen, Y., Zhao, T., & Wang, H. (2022). The Impact of Social Influence on Autonomous Vehicle Adoption: A Review of the Literature. *Transportation Research Part C: Emerging Technologies, 148*, 104059.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 319-340.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User Acceptance of Computer Technology: A Comparison of Two Theoretical Models. *Management Science, 35*(8), 982–1003. https://doi.org/10.1287/mnsc.35.8.982

Furinto, A., Armendra, A.P., Sasmita, & Tamara, D. (2022) Attitude Towards and Intention to Use After Experiencing Autonomous Vehicles: Evidence from Indonesia. *Proceedings of the First Australian International Conference on Industrial Engineering and Operations Management*, Sydney, Australia, December 20-21, 2022.

Grau, I., et al. (2018). A survey of LiDAR technology and its use in autonomous vehicle navigation. *Robotics, 7*(3), 30.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2010). PLS-SEM: Indeed, is it a common choice for International Business Research? *Journal of International Business Studies, 41*(4), 644-651.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2019). Partial least squares structural equation modeling (PLS-SEM): An emerging tool in business research. *European Business Review, 27*(4), 414-444.

International Society of Automation (ISA). (2023). What is Automation? Retrieved from https://www.isa.org/about-isa/what-is-automation

The Institute of Electrical and Electronics Engineers. New Level 3 Autonomous Vehicles Hitting the Road in 2020. Retrieved from https://innovationatwork.ieee.org/new-level-3-autonomous-vehicles-hitting-the-road-in-2020/

Li, Y., Wang, X., Chen, L., Zhai, L., & Ma, X. (2020). Factors affecting public acceptance of autonomous vehicles: Evidence from China. *Sustainability, 12*(2), 557.

Lin, P. (2018). Regulating artificial intelligence systems: Risks, challenges, competencies, and strategies. *Harvard Journal of Law & Technology, 31*(2), 653-688.

Liu, H., et al. (2019). Autonomous vehicles for urban driving environments: A survey. *IEEE Transactions on Intelligent Transportation Systems, 21*(4), 1510-1530.

Manfreda, A., Ljubi, K., Groznik, A. (2018). Autonomous Vehicles in The Smart Cities Era: An Empirical Study of Adoption Factors Important for Millennials. *International Journal of Information Management. 4th International Scientific – Business Conference LIMEN 2018 – Leadership & Management: Integrated Politics of Research and Innovations, Belgrade – Serbia, Dec 13, 2018.* https://doi.org/10.31410/limen.2018.419

Man, L., Zhang, Y., & Chen, X. (2018). Factors influencing consumers' adoption of autonomous vehicles: A theory of planned behavior perspective. *Transportation Research: Traffic Psychology and Behaviour, 55*, 121-133.

National Highway Traffic Safety Administration. (2020). Retrieved from https://www.nhtsa.gov/road-safety/adapted-vehicles

National Highway Traffic Safety Administration (NHTSA). (2016). Automated Driving Systems: A Preliminary Evaluation of the Safety of Google's Self-Driving Cars. U.S. Department of Transportation.

Pan, X., et al. (2020). A comprehensive survey on lane detection. *IEEE Transactions on Intelligent Transportation Systems, 21*(8), 3168-3187.

Sitinjak, C., Tahir, Z., Toriman, M. E., Lyndon, N., Simic, V., Musselwhite, C., Simanullang, W. F., & Hamzah, F. M. (2023). Assessing Public Acceptance of Autonomous Vehicles for Smart and Sustainable Public Transportation in Urban Areas: A Case Study of Jakarta, Indonesia. *Sustainability*, 15(9), 7445. https://doi.org/10.3390/su15097445

Transportation Minister of Indonesia. (2022). Indonesia's first autonomous electric vehicle trial inaugurated at Q-Big BSD City. Retrieved from https://jakartaglobe.id/special-updates/indonesia-kicks-off-first-autonomous-electric-vehicle-trial-in-bsd-city

Van der Heijden, R., Van Arem, B., & Happee, R. (2017). Factors that influence the acceptance of self-driving vehicles: An exploratory study. *Transportation Research Part F: Traffic Psychology and Behaviour, 49*, 64-70.

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science, 46*(2), 186-204.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly, 27*(3), 425-478.

Yang, L., Niu, W., & Zhang, Y. (2019). Determinants of the intention to use autonomous vehicles: Evidence from a survey in China. *Sustainability, 11*(11), 3117.

Zhang, J., Wu, L., Li, X., & Cui, B. (2020). Exploring user acceptance of autonomous vehicles in China: An extended technology acceptance model. *Sustainability, 12*(8), 3150.

Zheng, Y., & Gao, B. (2021). Exploring the factors influencing intention to use autonomous vehicles: A review of the literature. *Transportation Research Part C: Emerging Technologies, 133*, 103478.

Zhou, X., Logan, D. B., & Vu, H. L. (2022). Private autonomous vehicle safety: A simulation study. *Transportation Research Part C: Emerging Technologies, 136*, 103561.

Zhu, Y., Zhang, Y., & Chen, X. (2017). Understanding consumers' adoption of autonomous vehicles: A meta-analysis of the theory of planned behavior. *Transportation Research: Traffic Psychology and Behaviour, 48*, 1-10.