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TAM to Measure Electric Motorcycle Adoption Interest in West Kalimantan

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Abstract

Purpose: This research examines the factors that affect the interest in adopting electric motorcycles in West Kalimantan, using an extended version of the Technology Acceptance Model (TAM). It explores how perceived usefulness (PU), perceived ease of use (PEOU), and crucial external variables like perceived enjoyment (PE), compatibility (C), and perceived resources (PR) affect adoption intentions.

Methodology/approach: This study adopted a quantitative methodology, gathering data from an online questionnaire completed by 200 purposively sampled respondents in West Kalimantan. The collected data were subsequently analyzed using Structural Equation Modeling (SEM) with the AMOS software, employing Maximum Likelihood (ML) estimation to test the relationships.

Results/findings: The study finds that PEOU positively and significantly influences both PU and BI. PU also significantly affects adoption intentions. Crucially, external factors like PE and C were found to significantly shape these core perceptions, While PR did not show a statistically significant impact on either PEOU or PU.

Conclutions: Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) are the primary factors driving the intention to adopt electric motorcycles in West Kalimantan., with PEOU emerging as the most dominant factor. The extended TAM model validates that external variables like enjoyment and compatibility influence these initial perceptions, while perceived resources play a negligible role at this early stage of interest formation.

Limitations: The study's non-probability sampling method and cross-sectional data collection limit generalizability.

Contribution: This research provides valuable insights into technology adoption within green transportation, offering practical recommendations for manufacturers and policymakers to accelerate the transition.

Keywords: *Adoption Intentions, Electric Motorcycles, Green Transportation, Kalimantan Barat, Technology Acceptance Model*

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1. Introduction

Climate change and air pollution have become global issues that require urgent attention and swift action to mitigate their effects. The transportation industry is one of the most significant contributors to greenhouse gas emissions and is therefore a primary focus of global climate-mitigation efforts. In Indonesia, the rapid growth of motor vehicles has worsened air quality and increased the nation's dependence on fossil fuels. Consequently, environmentally friendly transportation (green transportation) has emerged as a highly promising solution. One of the most prominent technological innovations in green transportation is the electric motorcycle (e-motorcycle). These vehicles produce no direct emissions and thus have substantial potential to reduce the carbon footprint of the transportation sector in the long run.

The adoption of electric vehicles supports the Sustainable Development Goals (SDGs), particularly SDG 7 on affordable and clean energy, and SDG 13 on climate action. Indonesia's commitment to reducing greenhouse gas emissions is reflected in several existing policies, including Presidential Regulation No. 98 of 2021 on the Implementation of Carbon Economic Value (Jolodoro, Perdana, & Withaningsih, 2025; Mulyani & Octalica, 2023). This regulation serves as the legal foundation for realizing the targets of the Nationally Determined Contribution (NDC) and functions as an emission control instrument in the national development framework. The government's seriousness in reducing carbon emissions is also demonstrated through the National Action Plan for Greenhouse Gas Emission Reduction (RAN-GRK), a document designed as a guide for local governments to implement programs that directly and indirectly reduce emissions at the regional level (Alviya, Sarker, Sarvaiya, & Iftekhar, 2021).

A study by McKinsey projects that the electric motorcycle market in Indonesia will grow by 67% annually until 2030, one of the fastest growth rates in Asia (Farmer, Gupta, Lath, & Manuel, 2022). Policy support further strengthens this momentum, as reflected in Presidential Regulation 55/2019 on the Acceleration of the Battery-Based Electric Vehicle Program (KBLBB) (Wijaya, Kumara, Partha, & Divayana, 2021). Government projections target 4.5 million electric motorcycles by 2035, supported by subsidy incentives and the development of charging infrastructure under Ministerial Regulation of the Ministry of Energy and Mineral Resources No. 1 of 2023 (Faturrochman & Yaasiin, 2024; Simanjuntak, 2024). Despite positive national trends, the adoption of electric motorcycles at the regional level, particularly in West Kalimantan Province, remains very low. In 2024, the province recorded only 644 electric motorcycles Harmanta (2024) and Astuti (2024), a stark contrast to the 154,690 conventional motorcycles. One of the main challenges in West Kalimantan is the lack of supporting infrastructure, such as the limited and uneven distribution of charging stations, particularly outside major cities. In addition, electricity grid constraints in several areas hinder infrastructure development.

However, the geographic characteristics of urban areas in West Kalimantan, where daily travel distances are relatively short, make the region highly suitable for electric-vehicle adoption. Transitioning to electric motorcycles offers broader benefits beyond mere environmental conservation. It has the potential to stimulate the local economy and strengthen the energy security. Economically, this transition can create new business opportunities in the development of charging stations, conversion workshops and after-sales services. The wider adoption of electric vehicles will also promote local energy independence by reducing reliance on conventional fuel sources, the prices of which tend to be unstable and whose supply still largely depends on imports. However, low public awareness and interest remain major challenges.

This study specifically aimed to examine the determinants shaping the public interest in adopting electric motorcycles in West Kalimantan. To analyze the driving and inhibiting factors, this study employs the theoretical lens of the Technology Acceptance Model (TAM). This framework focuses on how individuals' perceived usefulness and perceived ease of use shape their intention to use technology. Beyond the core TAM variables, this study also integrates external factors—enjoyment, compatibility, and resource availability—to provide a more comprehensive understanding and formulate practical recommendations to address existing constraints.

2. Literature Review and Hypothesis Development

2.1 Green Transportation

Green transportation is an approach aimed at reducing the negative environmental impacts of transportation by focusing on lower energy consumption and reduced greenhouse gas emissions. Its implementation includes various initiatives such as the use of electric vehicles (EVs), the development of efficient public transportation systems, the provision of infrastructure for cycling and walking, and the utilization of renewable fuels (Rehman, Noman, Wu, & Khan, 2025). The rapid growth of urban populations and the increasing number of vehicles on the road have intensified environmental problems, with the transportation sector being one of the largest contributors to global carbon dioxide (CO_2) emissions (Yaacob, Yazid, Abdul Maulud, Khahro, & Javed, 2024). To address this issue, the adoption of electric vehicles has become a key strategy for transforming transportation systems, reducing dependence on fossil fuels, and mitigating the environmental burdens they create.

Unlike conventional vehicles that rely on gasoline or diesel, electric vehicles operate using rechargeable batteries powered by electricity sourced from renewable energy systems, such as wind or solar power. The transition toward electric vehicles is expected to play a crucial role in reducing emissions and improving air quality, especially in cities with high traffic congestion (Wable, Gholap, Gunjal, Kshirsagar, & Ahmad, 2025). Green transportation, particularly electric vehicles, offers substantial economic advantages by reducing operational costs. Compared with conventional vehicles, EVs provide significant savings in fuel and routine maintenance expenses. With advancements in battery technology and the continued expansion of charging infrastructure, electric vehicles are becoming increasingly efficient and affordable (Lazuardy et al., 2024).

2.2 Electric Motorcycles

In line with the global agenda to reduce fossil fuel consumption and carbon emissions, the adoption of efficient and environmentally friendly electric motorcycles is becoming increasingly essential. Their primary advantage lies in their zero tailpipe emission technology, making them an effective solution for reducing transportation-related pollution levels. As a result, the air quality in major cities can improve significantly (Madan, 2023). Although the initial cost is relatively higher, electric motorcycles prove to be more cost-efficient over their life cycle owing to lower operational and maintenance expenses. This cost advantage is expected to grow in the future, driven by more efficient large-scale production at full industrial capacity (Cox & Mutel, 2018).

The Indonesian government's strong policy support for eco-friendly transportation infrastructure has accelerated the domestic market share of electric motorcycles in Indonesia. Indonesia has set an ambitious target for electric motorcycle adoption, aiming to reach a population of 4.5 million units by 2035. This target, projected to account for 30% of total domestic motorcycle sales, has a solid policy foundation, as stipulated in Presidential Regulation No. 55 of 2019 (Wijaya et al., 2021). This ambitious goal is reinforced by fiscal incentives, subsidy programs, and the large-scale development of battery charging infrastructure. From a technical perspective, electric motorcycles offer stable and responsive performance, supported by increasingly advanced control systems such as regenerative braking and digital connectivity (Castillo Aguilar, Perez Fernandez, Velasco García, & Cabrera Carrillo, 2017). In addition, advancements in battery technology, particularly lithium-ion batteries, have enhanced the riding range and charging speed, making electric motorcycles increasingly suitable for the mobility needs of urban populations (Velev, Djudzhev, Dimitrov, & Hinov, 2024).

Research and Markets (2022) indicates that the domestic light electric vehicle industry has strong potential for accelerated growth, revealing substantial market opportunities. With a projected Compound Annual Growth Rate (CAGR) of 25.3%, the market value is expected to rise significantly over a five-year period, from USD 681.2 million in 2021 to USD 2,106.8 million by 2026. The key drivers of this growth include rising environmental awareness, government incentives, and increasing fossil fuel prices. The report also identified several major players in Indonesia’s light electric vehicle market, such as Polygon, NIU Technologies, Viar, United Bike, Selis, Tomara, Gesits, Gelis, and Volta. The presence of these diverse manufacturers demonstrates healthy competition and continuous innovation in Indonesia’s electric-vehicle industry (Lestari, Kamandanu, & Prayitno, 2022; Research & Markets, 2022).

2.3 Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) is one of the most widely used and influential theoretical frameworks for understanding and predicting how individuals or groups respond to technological innovations. This conceptual model is recognized as a robust analytical tool for examining the determinants of users' adoption intention. TAM posits that an individual's tendency or intention to perform a particular behavior (Behavioral Intention to Use)in this context, adopting a technologyis driven by two primary factors: Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). Kurnia, Situmorang, and Sudiyono (2025), Suparman (2023), and Firdaus, Krisbiantoro, and Afiana (2022) demonstrated that when users perceive a technology as beneficial and easy to use, they are more likely to develop positive intentions to adopt it.

Behavioral intention is regarded as the strongest predictor of Actual Use (Actual Use). However, positive intentions do not always translate into real behavior. This phenomenon, known as the intention–behavior gap, suggests that situational factors may hinder intentions from becoming actual actions (Conner & Norman, 2022). Therefore, although TAM ultimately leads to actual usage, this study focuses on behavioral intention as the closest proxy for adoption. Research by Quah (2023); Sugiarti and Rusmana (2022); and Kadir and Tricahyono (2023) confirms that behavioral intention is a strong and positive predictor of actual use. In other words, the stronger an individual's initial commitment to using a system, the higher is the likelihood of actual adoption.

Recognizing that technology acceptance is influenced by a broader range of factors, the original TAM model is often extended to include external variables—factors outside the core perceptions that may influence PU and PEOU. This flexibility allows researchers to adapt the TAM to specific contexts (Burton-Jones & Hubona, 2006; Chahal & Rani, 2022). In the adoption of electric motorcycles, relevant external variables may include social influence (subjective norms), environmental concern, personal innovativeness, and the external variables examined in this study: enjoyment (intrinsic motivation), lifestyle compatibility, and resource availability. An empirical study in Indonesia found that several key factors influence consumers' interest in purchasing electric vehicles. Specifically, Perceived Ease of Use, Perceived Usefulness, and Price Value positively affect attitude toward purchasing. Furthermore, Attitude, Price Value, and government financial incentives significantly drive Purchase Intention (Permana, Yuliati, & Wulandari, 2023).

TAM has consistently proven to be an accurate and efficient framework for analyzing user adoption of technology across various settings (Yulianti, Illahi, & Cantika, 2025). The application of TAM to electric vehicle adoption—particularly in developing countries—has been widely examined, including in Bangladesh, Liberia, India, and Turkey (Bektaş & Akyıldız Alçura, 2024; Chanda, Vafaei-Zadeh, Hanifah, Ashrafi, & Ahmed, 2024; Eze et al., 2025; Shanmugavel, Alagappan, & Balakrishnan, 2022). Applying TAM to the adoption of electric motorcycles can help stakeholders predict adoption levels and usage patterns, thereby supporting better planning and decision making.

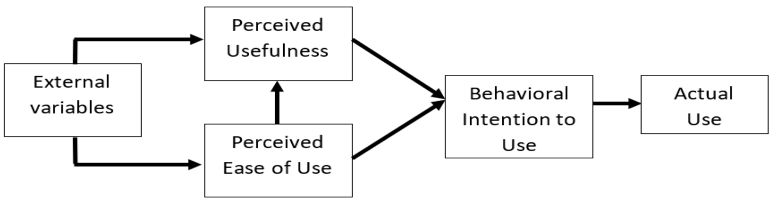

Figure 2. Technology Acceptance Model (TAM)
Source: Venkatesh & Davis (2000)

2.4 Perceived Usefulness (PU)

Perceived Usefulness (PU) refers to the degree to which an individual believes that using a particular technology will provide benefits, such as increased productivity, enhanced effectiveness, or overall improvement in performance (Yulianti et al., 2025). In the context of electric motorcycles, PU reflects the belief that using the vehicle will help users achieve their daily mobility goals more efficiently, such as lowering operational costs, increasing travel productivity, or contributing to a cleaner environment. Within the framework of the Technology Acceptance Model (TAM), a user's belief that a technology delivers meaningful benefits (PU) is a primary driver that significantly shapes their intention to adopt it. This means that the higher a user's perceived usefulness of a technology, the stronger is their intention to use it. Yang, Gong, Land, and Chesney (2020) found that perceived usefulness plays a key role in predicting the adoption of new technologies.

Their study demonstrated that the greater the benefits perceived by users, the stronger their intention to use the technology. Numerous studies have shown that PU is a strong predictor of Behavioral Intention to Use (BIU). However, technology adoption is not influenced by perceived usefulness alone; it is also shaped by external factors that may modify users' perceptions of technology. External variables, such as perceived resources, compatibility, and social norms, play a significant role in shaping perceived usefulness. For example, Sitorus, Govindaraju, Wiratmadja, and Sudirman (2019) found that external factors such as ease of access and lifestyle compatibility influence users' perceived usefulness of digital applications in e-commerce. Thus, PU is influenced not only by the intrinsic characteristics of the technology but also by external factors relevant to the user.

In addition, other external factors, such as perceived enjoyment, shape perceived usefulness. Users who enjoy the experience of riding an electric motorcyclebeyond its utilitarian advantagesare more likely to perceive it as beneficial. This aligns with the findings of Nordhoff et al. (2020), who confirmed that enjoyment derived from using technology influences perceived usefulness, particularly in technologies related to entertainment or mobility. A study by Butt and Singh (2023) on the adoption of electric motorcycles in Pakistan similarly found that PU positively affected adoption intention. Based on this theoretical foundation, the first hypothesis of this study is proposed as follows:

- **H1: Perceived Usefulness (PU) has a positive and significant effect on Behavioral Intention to Use (BIU) electric motorcycles.**

2.5 Perceived Ease of Use (PEOU)

Perceived Ease of Use (PEOU) refers to the degree to which an individual believes that interacting with a new technology will not require excessive mental or physical effort. This reflects a user's perception that the system can be operated smoothly and without significant complexity (Yulianti et al., 2025). In the context of electric motorcycles, PEOU relates to users' perceptions that operating, maintaining, and charging the vehicle are easy. The likelihood of adopting a new technology increases when users consider it simple to use, as high ease of use reduces learning barriers and minimizes the effort and time required to master the technology (Ampriyadi & Tafiprios, 2025). The importance of Perceived Ease of Use (PEOU) lies in its ability to influence adoption intention through two distinct pathways. The first is a direct pathway, in which PEOU significantly enhances Behavioral Intention to Use (BIU).

The second is an indirect pathway, whereby users' perceived ease of using a technology has been shown to improve their perception of its usefulness (Perceived Usefulness [PU]), which in turn further strengthens their intention to use it. Prior studies have extensively examined the relationship between PEOU and PU. According to Liesa-Orús, Latorre-Cosculluela, Sierra-Sánchez, and Vázquez-Toledo (2023), ease of use has a significant effect on how users evaluate the usefulness of a technology. This relationship is particularly important in the adoption of electric motorcycles, where users' perceptions of how easy the technology is to operate can increase their confidence in its usefulness, thereby reinforcing their intention to use it (BIU). Additionally, PEOU plays a crucial role in technology adoption because it reduces the perceived effort required to use the technology, making the transition to electric motorcycle use easier and more appealing (Saleh, Maupa, Cokki, & Sadat, 2025). Based on this reasoning, the following hypotheses are proposed.

- **H2: Perceived Ease of Use (PEOU) has a positive and significant effect on Behavioral Intention to Use (BIU) electric motorcycles.**
- **H3: Perceived Ease of Use (PEOU) has a positive and significant effect on Perceived Usefulness (PU).**

2.6 External Variables

Although the Technology Acceptance Model (TAM) introduced by Davis (1989) serves as the fundamental framework for analyzing technology adoption, the original model often requires modification to better suit specific contexts, such as electric motorcycles. Therefore, contemporary research frequently incorporates several external variables. These additional factors are considered crucial because they act as antecedents that shape users' beliefs regarding ease of use (PEOU) and usefulness (PU), both of which eventually become the main determinants of Behavioral Intention (BI) to adopt the technology. The inclusion of external variables such as Perceived Enjoyment (PE), compatibility (C), and Perceived Resources (PR) is particularly relevant to the adoption of electric motorcycles, as these external factors enrich the analytical framework and provide a more comprehensive understanding of technology adoption behavior.

- **Perceived Enjoyment (PE):** Perceived Enjoyment refers to the intrinsic motivation users experience when interacting with a technology. Yulianti et al. (2025) indicated that when a technology provides an enjoyable experience, it is perceived as easier to use, thereby increasing the likelihood of adoption. This is highly relevant in the context of electric motorcycles, where riding comfort and perceived environmental benefits can influence adoption decisions (Belananda, Ian, & Jamal, 2025).
- **Compatibility (C):** Compatibility refers to the degree to which a new technology can be seamlessly integrated into a user's existing environment. This includes alignment with personal values, habits established based on prior experience, and the functional requirements of potential users. Technologies that are perceived as compatible with an individual's lifestyle are more likely to be viewed as easy to use and useful (Karahanna, Straub, & Chervany, 1999). In the case of electric motorcycles, compatibility with conventional motorcycles plays an important role in influencing perceptions of ease of use and usefulness (Campino, Mendes, & Rosa, 2023; Su et al., 2023).
- **Perceived Resources (PR)**: Perceived Resources refer to users' assessment of the availability of resources required to utilize a technology, including financial resources to purchase the technology, the skills needed to operate it, and access to supporting infrastructure such as charging stations. In the context of electric motorcycles, the availability of charging facilities and affordability of the vehicle are major factors that shape users' perceptions of ease of use and usefulness (Ludin et al., 2023).

Based on these external variables, the following hypotheses were formulated:

- H4: **Perceived Enjoyment (PE) has a positive and significant effect on Perceived Usefulness (PU).**
- H5: **Perceived Enjoyment (PE) has a positive and significant effect on Perceived Ease of Use (PEOU).**
- H6: **Compatibility (C) has a positive and significant effect on Perceived Usefulness (PU).**
- H7: **Compatibility (C) has a positive and significant effect on Perceived Ease of Use (PEOU).**
- H8: **Perceived Resources (PR) has a positive and significant effect on Perceived Usefulness (PU).**
- H9: **Perceived Resources (PR) has a positive and significant effect on Perceived Ease of Use (PEOU).**

2.7 Conceptual Framework

Based on the literature review, the conceptual framework of this study integrates external variables (PE, C, PR) into the basic TAM model to examine their influence on the core constructs (PU, PEOU) and adoption intention (BI).

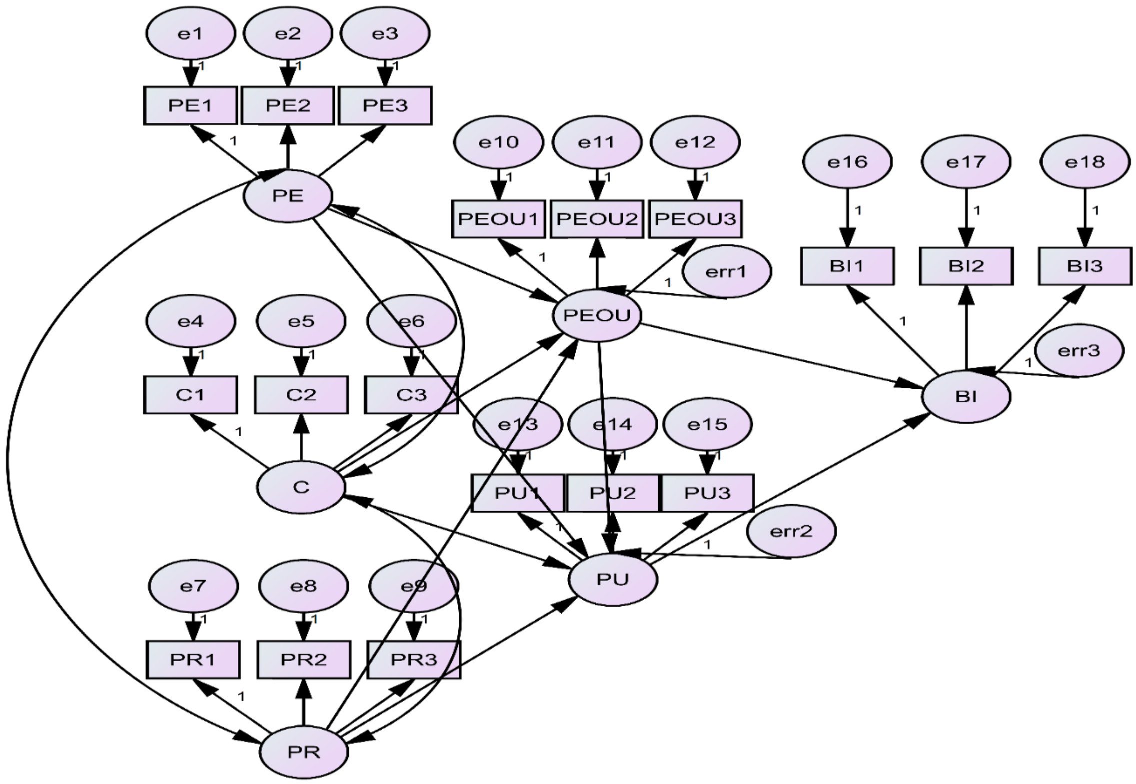

Figure 1: Conceptual Framework
Source: Developed by the researcher (2025)

3. Research Methodology

3.1 Research Design and Data Collection

Grounded in the theoretical foundation of the Technology Acceptance Model (TAM) introduced by ((Davis, 1989), this study aims to analyze decision-making regarding the adoption of new technologies. Specifically, this study employed a quantitative approach using a survey design to evaluate how the extended TAM model explains the interest of West Kalimantan residents in adopting electric motorcycles. The main focus was to examine how perceptions of usefulness and ease of use, together with other influencing factors, shape adoption intentions in the region. The sampling process in this study used a non-probability approach. In particular, purposive sampling was applied, whereby respondents were deliberately selected based on predefined criteria aligned with the study's objectives. This method was chosen to ensure that the research reached the most relevant societal groups who are likely to be potential early adopters of electric motorcycles.

However, the use of a non-random sampling technique, where respondent selection is not based on equal probability, naturally limits the external validity of this study. Consequently, statistical inferences from the findings cannot be directly generalized to the entire population of West Kalimantan. The results are more appropriately interpreted as strategic insights for specific target segments rather than as population-wide estimates. Moreover, this approach is effective in identifying adoption factors among early adopters, which is crucial for policymakers and stakeholders.

The respondent criteria in this study were specifically designed to reflect the characteristics of the population in West Kalimantan that were relevant to the research topic. Barat (2025) indicates that the selected respondents fall within the productive age range (17–49 years), which is the dominant demographic group that is highly mobile and more adaptive to technological innovation according to regional data. In addition, motorcycle ownership was a key criterion to ensure that respondents had direct experience and understanding of personal transportation operational needs. To capture perspectives aligned with the local government's green agenda, respondents were prioritized based on their interest in environmental issues and inclination toward sustainable solutions. Finally, recruitment was focused on urban areas such as Pontianak and Singkawang, where access to supporting infrastructure and shorter travel distances make electric motorcycle adoption more feasible and relevant for the study.

A digital questionnaire was designed and distributed through social media platforms to obtain primary data. This approach was chosen to obtain a heterogeneous sample of respondents. Structurally, the questionnaire consists of demographic sections as well as core sections evaluating participants' perceptions of the constructs within the Technology Acceptance Model (TAM). The measured variables included Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Perceived Enjoyment (PE), compatibility (C), Perceived Resources (PR), and Behavioral Intention to Use (BIU). Respondents' perceptions were assessed using a five-point Likert scale. The measurement instrument was adapted from relevant previous studies, a methodological step taken to ensure that the instrument met established validity and reliability standards.

The sample size was determined based on recommendations for Structural Equation Modeling (SEM), which suggests obtaining at least five to ten times the total number of indicator items used in the research questionnaire. With 18 indicators, the minimum required sample size ranged from 90 to 180 respondents. In this study, data were successfully collected from 200 respondents, making the sample size sufficiently large and statistically robust. Considering the complexity of the research model, which involves multiple latent constructs and their corresponding indicators, the chosen analytical technique is Structural Equation Modeling (SEM). This method is deemed most appropriate because of its advantages in simultaneously analyzing complex relationships among variables. All analytical procedures, from testing the validity and reliability of the measurement model to evaluating the structural model and testing hypotheses, were conducted using AMOS (Analysis of Moment Structures).

The theoretical foundation of this research is based on the Technology Acceptance Model (TAM), originally introduced by Davis ((Davis, 1989). This fundamental model posits that two central factors determine an individual's intention to use a technology: Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). In this study, the TAM framework was extended by incorporating additional external variables, including Perceived Enjoyment, compatibility, and perceived resources. This expansion aims to provide a more holistic understanding of the determinants that shape the public's intention to adopt electric motorcycles in West Kalimantan.

The central premise underlying this study is that users' perceptions of the usefulness and ease of use of electric motorcycles directly influence their intention to adopt the technology. Grounded in this assumption, this study seeks to offer practical insights for developing more effective promotional strategies that can benefit stakeholders, including manufacturers, government agencies, and the public. To ensure data integrity, all variables and measurement instruments were validated and tested for reliability using Cronbach's Alpha and Average Variance Extracted (AVE) as key evaluation benchmarks.

3.2 Measurement Instruments

The measurement instruments for all variables in this study were developed by adapting items from the established literature and modifying them to fit the context of electric motorcycle adoption in Indonesia. Each scale was carefully selected and refined to ensure its relevance and reliability for the target population, as summarized in Table 1.

Table 1. Operationalization of Variables and Research Indicators

Variable	Indicator	Source
Perceived Usefulness (PU)	PU1: I believe that using an electric motorcycle will improve the effectiveness of my daily commuting activities.	(Butt & Singh, 2023)
	PU2: By using an electric motorcycle, I can contribute to reducing air pollution.	
	PU3: Using an electric motorcycle will reduce operational costs (e.g., fuel and maintenance) compared to conventional motorcycles.	
Perceived Ease of Use (PEOU)	PEOU1: I believe that learning to operate an electric motorcycle is easy.	(Saleh et al., 2025)
	PEOU2: I think the process of charging an electric motorcycle battery does not require much effort.	
	PEOU3: I believe that maintaining an electric motorcycle is easier than maintaining a conventional motorcycle	
Perceived Enjoyment (PE)	PE1: I think riding an electric motorcycle will be an enjoyable experience.	(Belananda et al., 2025)
	PE2: Using environmentally friendly technology such as electric motorcycles will provide personal satisfaction for me.	
	PE3: I would feel excited to try something new, such as riding an electric motorcycle.	
Compatibility (C)	C1: Using an electric motorcycle fits my lifestyle and daily transportation needs.	(Su et al., 2023)
	C2: Adopting an electric motorcycle aligns with my personal values regarding environmental preservation.	
	C3: The way an electric motorcycle operates is not significantly different from conventional motorcycles, making it easy for me to adapt.	
Perceived Resources (PR)	PR1: I feel that I have sufficient financial resources to purchase an electric motorcycle.	(Ludin et al., 2023)
	PR2: I believe I can easily find battery charging or swapping stations near my residence.	
	PR3: I feel that I have adequate skills to operate and maintain an electric motorcycle.	

Behavioral Intention to Use (BIU)	BIU1: I am interested in purchasing or using an electric motorcycle in the near future.	(Firdaus et al., 2022)
	BIU2: I would prefer an electric motorcycle over a fossil-fuel motorcycle in the future.	
	BIU3: I would recommend the use of electric motorcycles to my family or friends.	

Source: Developed by the researcher (2025)

3.3 Data Analysis

To test the proposed research model, data analysis was conducted using AMOS software. The analysis procedure involved several key stages to ensure the accuracy and reliability of the results. In the first stage, descriptive statistics were used to summarize the respondents' demographic characteristics. After completing the data collection, the analysis proceeded to the measurement model validation phase, followed by testing the structural model. Before advancing to hypothesis testing, the measurement model must be evaluated. The primary objective of this stage was to verify the validity and reliability of each construct used in this study. Specifically, two indicators were used to assess internal consistency reliability: Cronbach's Alpha and Composite Reliability (CR). According to commonly accepted guidelines, a construct is considered to have acceptable reliability if its Cronbach's alpha value exceeds the threshold of 0.70.

Following the reliability test, the quality of the measurement model was examined by evaluating the construct validity through two major assessments. First, convergent validity was tested using the Average Variance Extracted (AVE), where a construct is considered valid if its AVE value exceeds 0.50. This threshold indicates that the variance explained by the construct is greater than that attributed to the error. Second, discriminant validity was assessed to ensure that each construct measured a unique concept. This was verified by comparing the square root of each construct's AVE, which must be greater than the correlations with all other constructs in the model. Once the measurement model validation was completed, the analysis proceeded to the evaluation of the structural model. In this phase, path coefficients were examined to determine the strength and direction of relationships among constructs, where a relationship is considered statistically significant if its p-value is below 0.05. This process also included hypothesis testing to verify the validity of the proposed relationships among the variables. Finally, the model's goodness of fit was assessed using several indices, including the Goodness of Fit Index (GFI), Tucker–Lewis Index (TLI), CMIN/DF, Root Mean Square Error of Approximation (RMSEA), Adjusted Goodness of Fit Index (AGFI), Chi-Square, and Probability Level. This comprehensive evaluation ensured that the tested model appropriately fit the data, allowing the results to be interpreted with confidence.

4. Results and Discussion

4.1 Respondent Characteristics

Of the 200 respondents who participated in the survey, the sample was dominated by males (67%). Most respondents were within the productive and tech-literate age groups, specifically 17–25 years (44%) and 26–35 years (36%) age groups. In terms of education, the majority held a bachelor's degree (D4/S1) at 51%, followed by senior high school/vocational graduates (27%). The occupational profile was dominated by private sector employees (39%) and students (30%). Overall, the demographic profile indicates that the respondents generally had a relatively high level of education and belonged to age groups that tended to be more open to adopting new technologies.

Table 2: Demographic Profile of Respondents

Characteristics	Category	Frequency	Percentage (%)
Gender	Male	134	67.0%
	Female	66	33.0%
Age	17-25 Years	88	44.0%
	26-35 Years	72	36.0%
	36-45 Years	30	15.0%
	> 45 Years	10	5.0%
Education Level	SMA / SMK	54	27.0%
	D3	28	14.0%
	D4 / S1	102	51.0%
	S2 / S3	16	8.0%
Occupation	Student	60	30.0%
	Private Employee	78	39.0%
	Entrepreneur	32	16.0%
	PNS / BUMN	20	10.0%
	Others	10	5.0%

Source: Processed by the researcher (2025)

4.2 Measurement Model Testing

Before testing the hypotheses, a measurement model assessment was conducted to ensure the reliability and validity of each construct used in this study. Reliability refers to the internal consistency of the items measuring a particular variable, whereas validity ensures that the instrument accurately measures the intended concept. Instrument reliability in this study was evaluated using Cronbach's Alpha and Composite Reliability (CR), with the accepted threshold for Cronbach's alpha set above 0.70. For convergent validity, which assesses the extent to which a set of indicators correlates positively in measuring the same underlying construct, the Average Variance Extracted (AVE) and factor loadings were examined. The required criteria included an AVE value greater than 0.50 and factor loadings exceeding 0.50 for each indicator.

Table 3. Convergent Validity and Reliability Test Results

Variable	Indicator	Factor Loading	Cronbach's Alpha	CR	AVE
	PU1	0.733	0.856	0.860	0.600

Perceived Usefulness (PU)	PU2	0.771			
	PU3	0.733			
Perceived Ease of Use (PEOU)	PEOU1	0.812	0.767	0.770	0.530
	PEOU2	0.814			
	PEOU3	0.731			
Perceived Enjoyment (PE)	PE1	0.765	0.847	0.850	0.680
	PE2	0.706			
	PE3	0.621			
Compatibility (C)	C1	0.644	0.806	0.810	0.680
	C2	0.668			
	C3	0.772			
Perceived Resources (PR)	PR1	0.706	0.847	0.850	0.680
	PR2	0.720			
	PR3	0.795			
Behavioral Intention (BI)	BI1	0.644	0.759	0.760	0.620
	BI2	0.627			
	BI3	0.651			

Source: Processed using IBM SPSS Amos (2025)

As shown in Table 3, the analysis confirms that all constructs meet the established criteria for reliability and convergent validity. Strong reliability was demonstrated through Cronbach's alpha values ranging from 0.759 to 0.856, while all Composite Reliability (CR) scores exceeded the recommended threshold of 0.70. Regarding convergent validity, all constructs exhibited AVE values higher than 0.50. Additionally, each indicator recorded a factor loading well above 0.50, confirming that every item accurately represented its respective latent construct. Therefore, the measurement model can be concluded as both convergently valid and reliable

4.3 Goodness of Fit Test

The next stage of the analysis involved assessing the goodness of fit to evaluate the degree of alignment between the proposed theoretical model and the empirical data collected. A summary of the model fit indices is presented in Table 4 below.

Table 4. Goodness of Fit Test Results

Criteria	Value	Recommended Threshold	Description

Chi-Square/df (CMIN/DF)	1.791	≤ 2.00	Good
GFI (*Goodness of Fit Index*)	0.894	≥ 0.90	Acceptable
AGFI (*Adjusted* GFI)	0.853	≥ 0.90	Acceptable
TLI (*Tucker Lewis* Index)	0.905	≥ 0.90	Good
CFI (*Comparative Fit* Index)	0.923	≥ 0.90	Good
RMSEA (*Root Mean Square Error*)	0.063	≤ 0.08	Good

Source: Data processed using IBM SPSS Amos (2025)

Based on the results in Table 4, it can be concluded that the research model meets the recommended goodness-of-fit criteria. Indices such as CMIN/DF (1.791), TLI (0.905), CFI (0.923), and RMSEA (0.063) all indicate a good level of model fit, suggesting that the structural model is appropriate and can be interpreted.

4.4 Structural Model Testing and Hypothesis Evaluation

After the measurement model was validated, the next step was to test the structural model to evaluate the causal relationships among the latent variables hypothesized in this study. This testing was conducted using Structural Equation Modeling (SEM) with AMOS software. The results of the structural model estimation, including the path coefficients and significance levels, are presented in Figure 2 and Table 5.

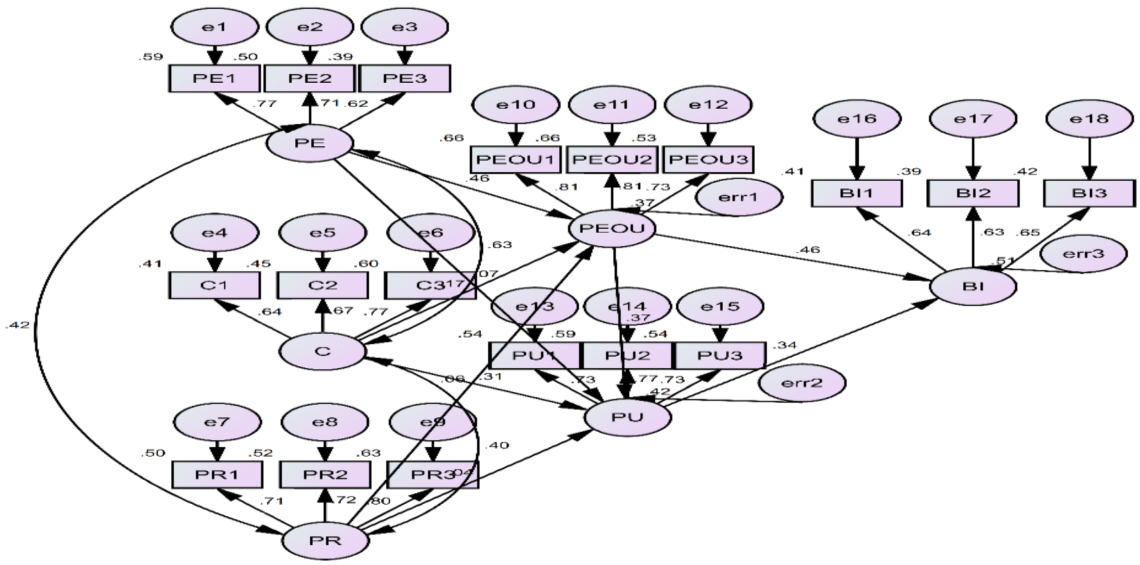

Figure 2. Structural Model Test Results (Path Analysis)
Source: Data processed using IBM SPSS Amos (2025)

Figure 2 presents the complete path model and standardized coefficients for each hypothesized relationship. These values indicate the strength and direction of the effects of the variables. For formal hypothesis testing, the Critical Ratio (C.R.) and probability level (P) are used. In this study, a hypothesis was considered supported if its statistical test showed a significant result. The criterion for significance was met when the obtained P-value did not exceed 0.05.

Table 5. Summary of Hypothesis Testing Results

Hypothesis	Path	Estimate	C.R.	P	Conclusion
H1	PU -> BI	0.294	2.758	0.006	Supported
H2	PEOU -> PU	0.333	3.391	***	Supported
H3	PEOU -> BI	0.363	3.649	***	Supported
H4	PE -> PU	0.070	0.496	0.620	Not Supported
H5	PE -> PEOU	0.524	3.559	***	Supported
H6	C -> PU	0.360	2.458	0.014	Supported
H7	C -> PEOU	0.218	1.376	0.169	Not Supported
H8	PR -> PU	0.039	0.424	0.672	Not Supported
H9	PR -> PEOU	0.066	0.631	0.528	Not Supported

Source: Processed by the researcher (2025)

Based on the results of the hypothesis testing or path coefficients summarized in Table 5, the following conclusions can be drawn.

1. Perceived Usefulness (PU) was a positive and significant predictor of Behavioral Intention (BI) (C.R. = 2.758; $p < 0.001$). This finding confirms that the greater the perceived usefulness of an electric motorcycle, the stronger the intention to adopt it. Thus, H1 is supported.
2. Perceived Ease of Use (PEOU) was a significant and positive antecedent of Perceived Usefulness (PU) (C.R. = 3.391; $p < 0.001$). This indicates that a technology perceived as easy to use will also be considered more useful by potential users. Hence, H2 is supported.
3. There is a direct, positive, and significant effect of Perceived Ease of Use (PEOU) on Behavioral Intention (BI) (C.R. = 3.649; $p < 0.001$). This confirms that the ease of operating an electric motorcycle directly encourages adoption intention. Therefore, H3 is supported.
4. Perceived Enjoyment (PE) did not significantly affect Perceived Usefulness (PU) (C.R. = 0.496; $p = 0.620$). Although enjoyment contributes to the user experience, this result shows that enjoyment alone is not strong enough to influence perceptions of functional usefulness. This indicates that users are more focused on practical and utilitarian aspects rather than hedonic elements when evaluating the benefits of technology. Thus, H4 is not supported.
5. Perceived Enjoyment (PE) has a positive and significant influence on Perceived Ease of Use (PEOU) (C.R. = 3.559; $p < 0.001$). This finding implies that a pleasant experience makes technology easier to use. Therefore, H5 is supported.
6. Compatibility (C) with users' lifestyle and personal values significantly and positively affected Perceived Usefulness (PU) (C.R. = 2.458; $p = 0.014$). This implies that when electric motorcycles are perceived as being in line with one’s lifestyle and personal values, their perceived usefulness increases. Thus, H6 is supported.
7. Compatibility (C) did not significantly affect Perceived Ease of Use (PEOU) (C.R. = 1.376; $p = 0.169$). This indicates that although electric motorcycles may be considered compatible with a user’s lifestyle, this does not automatically influence the ease of operation. Compatibility relates more to values and routines than to the technical complexity of usage. Therefore, H7 is not supported.
8. Perceived Resources (PR) did not significantly affect on Perceived Usefulness (PU) (C.R. = 0.424; $p = 0.672$). This suggests that the availability of resources, whether financial or infrastructural, does not influence functional perceptions of usefulness in the early stages of adoption. This may be because users focus more on intrinsic technological aspects (ease and practical benefits) before

considering the resources required for use. At the behavioral intention stage, users may prioritize whether the technology is effective and meets their needs, rather than evaluating resource availability. Thus, H8 is not supported.

9. Perceived Resources (PR) also did not significantly influence Perceived Ease of Use (PEOU) (C.R. = 0.631; p = 0.528). Similar to the previous hypothesis, perceived resource availability does not affect users' judgments regarding the ease of operating an electric motorcycle. This means that respondents do not associate ease of use with external issues such as charging infrastructure or financial capability. Therefore, H9 is not supported.

4.5 Discussion

Based on the statistical analyses conducted, this section provides a detailed explanation of the findings related to each proposed hypothesis. Overall, this study offers empirical evidence that reinforces the core principles of the Technology Acceptance Model (TAM), demonstrating that Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) are critical determinants shaping the Behavioral Intention (BI) to adopt electric motorcycles among the people of West Kalimantan. However, the influence of external variables exhibits mixed results, offering more nuanced insights into the adoption of environmentally friendly technologies in this region.

4.5.1 The Influence of Perceived Usefulness (PU) on Behavioral Intention (BI)

Based on the statistical tests, H1 is supported. This indicates that Perceived Usefulness (PU) is a positive and significant predictor of Behavioral Intention (BI), with $\beta = 0.294$ and $p = 0.006$. This finding reinforces one of the central pillars of the TAM framework, which posits that when individuals believe that a technology will provide tangible benefits, such as improved efficiency, cost savings, or contributions to environmental sustainability, their intention to adopt the technology becomes stronger. This result is consistent with numerous previous studies across various technological contexts. For instance, Teo and Noyes (2011) confirmed that perceived usefulness is the strongest predictor of behavioral intention in technology adoption among educators.

The importance of Perceived Usefulness (PU) as the primary driver of adoption intention, as observed in this study, has been repeatedly validated in multiple domains. Theoretically, this supports the conclusions of Yang et al. (2020), who emphasized the fundamental role of PU in predicting technology adoption. Practically, within the context of electric vehicles, this finding aligns with the results of Butt and Singh (2023), who specifically identified that perceived benefits, such as lower operational costs and environmental friendliness, are key determinants influencing consumers' willingness to switch to electric motorcycles.

4.5.2 The Influence of Perceived Ease of Use (PEOU) on Perceived Usefulness (PU)

The findings of this study strongly confirm one of the fundamental propositions of the Technology Acceptance Model (TAM) introduced by Davis (1989), namely that Perceived Ease of Use (PEOU) is a crucial antecedent of Perceived Usefulness (PU). In line with H2, the results show that PEOU positively and significantly determines PU ($\beta = 0.333$, $p < 0.001$). The logic behind this relationship is that when a technology does not require substantial cognitive effort, users are better able to recognize and appreciate its various benefits. A similar pattern has been observed in other technological contexts. For example Bakı, Bırgoren, and Aktepe (2018) in their study on the adoption of wearable technology, also demonstrated that perceived ease of use plays a pivotal role in shaping beliefs about the usefulness of the technology.

4.5.3 The Influence of Perceived Ease of Use (PEOU) on Behavioral Intention (BI)

Strong support was also found for Hypothesis H3 ($\beta = 0.363$, $p < 0.001$), confirming a positive and significant effect of Perceived Ease of Use (PEOU) on Behavioral Intention (BI). This finding highlights the central role of ease of use as a major driver of adoption intention, both directly and indirectly. In West Kalimantan, the belief among potential users that electric motorcycles are practical and hassle-free is a crucial factor shaping their intention to adopt them. This result aligns with Portz et al. ’s (2019) study Portz et al. (2019)on technology adoption among older adults, which concluded that simple, easy-to-navigate interfaces are key elements in fostering usage intention.

4.5.4 Influence of External Variables on Perceptions

The analysis of external variables produced more varied findings.

- Perceived Enjoyment (PE) and Its Influence: Hypothesis H5 is supported ($\beta = 0.524$, $p < 0.001$), indicating that Perceived Enjoyment positively influences Perceived Ease of Use (PEOU). This finding reinforces Van der Heijden (2004) argument that when an activity is perceived as enjoyable (hedonic aspect), individuals tend to consider it easier to perform. However, H4 was not supported ($p = 0.620$), meaning that enjoyment does not significantly affect Perceived Usefulness (PU). This suggests that respondents distinguish between hedonic (enjoyment) and utilitarian (functional benefits) aspects. A satisfying riding experience does not automatically make users perceive electric motorcycles as more cost-efficient or effective, implying that intrinsic motivation does not necessarily correlate with functional utility.
- Compatibility (C) and Its Influence: Hypothesis H6 is supported ($\beta = 0.360$, $p = 0.014$), indicating that compatibility with personal values and lifestyle significantly increases Perceived Usefulness (PU). When an innovation aligns well with existing needs and values, its benefits are perceived as more relevant to the user. This result aligns with the conclusions of (Scherer, Tondeur, Siddiq, & Baran, 2018). found that the ability of a technology to integrate with existing workflows is a key determinant in shaping perceived usefulness during adoption. Conversely, hypothesis H7 is not supported ($p = 0.169$), showing that compatibility does not influence Perceived Ease of Use (PEOU). This suggests that although electric motorcycles may fit well with users’ lifestyles, such compatibility does not change their perceptions of technical complexity.
- Perceived Resources (PR) and Its Influence: Interesting results were found for Hypotheses H8 ($p = 0.672$) and H9 ($p = 0.528$), both of which were not supported. This indicates that Perceived Resources—including financial capacity and infrastructure availability—do not significantly affect Perceived Usefulness (PU) or Perceived Ease of Use (PEOU) at the perception-forming stage. This may imply that during the early evaluation of a technology, potential users focus more on intrinsic features and capabilities rather than resource-related issues. Resource availability may become a more tangible barrier later, particularly during the actual purchase decision stage, rather than during the initial formation of perceptions of sustainability. Nevertheless, these findings contrast with those of previous research, such as Taylor and Todd (1995), who found that resource availability was a significant predictor of intention. The difference in results may stem from the focus of this study on early stage interest, where resource concerns generally emerge more strongly in the later stages of the decision-making process.

4.6 Managerial Implications

The practical implications of this study highlight the critical need for electric motorcycle manufacturers and policymakers to focus on communicating the ease of use and environmental benefits associated with electric motorcycles to potential consumers. Manufacturers and marketers should prioritize communication strategies that emphasize Perceived Ease of Use (PEOU), which emerged as the most dominant factor driving adoption intention. This includes highlighting the ease of operation, simple charging procedures, and minimal maintenance requirements. Because ((PE) was shown to significantly enhances PEOU, marketing campaigns and activities, such as test rides, should be designed to showcase the enjoyment and satisfaction derived from riding an electric motorcycle. Furthermore, marketers should actively communicate how electric motorcycles fit into consumers’ daily routines and lifestyles to strengthen Perceived Usefulness (PU), particularly in terms of operational cost savings, travel efficiency, and contributions to a cleaner environment.

Policymakers need more detailed and targeted measures to support the development of charging infrastructure and provide incentives for early adopters. Policies that can facilitate electric motorcycle adoption include prioritizing the installation of Public Electric Vehicle Charging Stations (SPKLU) and Battery Swapping Stations (SPBKLU) in accessible urban areas and along major transportation routes.

Such policies directly address adoption barriers that become more salient as potential users move from the interest stage to the actual purchase stage. To encourage early adoption, the government may also design more accessible and targeted incentive schemes, such as direct purchase subsidies, reduced annual vehicle taxes, or special electricity tariffs for home charging. These incentives are essential for reducing the financial barriers that often influence purchase decisions. Collectively, these measures would accelerate the transition toward sustainable transportation while generating long-term environmental and economic benefits at the local scale.

The government, in collaboration with manufacturers, should initiate large-scale public education campaigns to raise awareness. These campaigns should focus on the two key aspects highlighted by this study: disseminating information about ease of use (e.g., how to charge the motorcycle) and communicating functional benefits (e.g., simulations of cost savings). Through an integrated approach between manufacturers and policymakers, the adoption of electric motorcycles can be significantly increased, thereby supporting the achievement of national sustainable development goals (SDGs).

5. Conclusion

5.1 Conclusion

This study concludes that the intention to adopt electric motorcycles as a form of green transportation in West Kalimantan is rooted in the two main pillars of the Technology Acceptance Model, namely, perceived usefulness and the more dominant perceived ease of use. Ease of use plays the most crucial role because its influence operates through two pathways: directly encouraging adoption intention and indirectly strengthening the technology's perceived usefulness. The theoretical contribution of this study lies in validating the extended TAM model, demonstrating that external variables such as enjoyment and compatibility exert specific influences on certain perceptual paths, whereas perceived resources do not shape the initial perceptions. The practical implications provide a data-driven foundation for stakeholders. Manufacturers can develop more effective marketing strategies by emphasizing ease of use, enjoyable riding experiences, and lifestyle compatibility of e-bikes. To accelerate the adoption of electric motorcycles in West Kalimantan and Indonesia more broadly, detailed policy interventions from the government are required. Such policies may include expanding accessible charging infrastructure and offering financial incentives for consumers and manufacturers. Additionally, large-scale educational campaigns on environmental benefits and lower operational costs are essential to raise public awareness of sustainability and the economic advantages of transitioning to electric motorcycles. By implementing these targeted policies, the transition toward sustainable transportation can be accelerated significantly.

5.2 Limitations

Several aspects of this study present opportunities for improvement in future studies. The non-random (non-probability) sampling method and sample size (n = 200) may limit the generalizability of the findings to the broader population of West Kalimantan. Additionally, the cross-sectional nature of the study captures perceptions at only one point in time, preventing insights into how these perceptions may evolve over time. Finally, other factors such as perceived risk or socio-cultural influences, which may play an important role in the adoption of electric motorcycles, were not included in this study.

5.3 Suggestions

Future research can strengthen and expand these findings through methodological improvements. First, to enhance the generalizability of the results, probability sampling methods should be employed, and respondents from a wider geographical area should be involved. Second, to obtain more dynamic insights, longitudinal research designs would be highly beneficial, allowing researchers to observe how consumer perceptions and adoption behaviors evolve over time. Furthermore, socio-cultural factors that may influence electric motorcycle adoption should be incorporated into future studies, given the role of social norms, cultural values, and local communities in shaping technological acceptance. For example, researchers may explore how community leaders influence perceptions, how electric motorcycle ownership relates to social status, and how tensions may emerge between environmental modernity and conventional riding traditions. By integrating these additional contextual factors, future studies can produce a more comprehensive model explaining the dynamics of electric motorcycle adoption, offering a more holistic view of the elements shaping consumers' purchase intentions, particularly in developing countries.

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