Driving Sustainable Consumer Behavior: The Influence of Vehicle Performance and Total Cost Ownership on Electric Motorcycle Purchase Intention

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Abstract. This study examines the influence of vehicle performance and total cost ownership on consumers' intention to purchase electric motorcycles in emerging markets, focusing on Java Island. Using a quantitative survey approach, the research analyzes how consumers' perceptions of performance and affordability shape their attitudes and drive purchase intentions. The findings reveal that positive perceptions of performance and cost lead to favorable attitudes that encourage purchase decisions. Consumers are more likely to adopt sustainable mobility when they view electric motorcycles as efficient and economically beneficial. The study highlights the crucial role of attitude in connecting marketing factors to sustainable buying behavior. These insights contribute to the development of green marketing strategies and public policies aimed at increasing consumer acceptance of environmentally friendly transportation in developing economies.

1 Introduction

Indonesia has faced many challenges in terms of carbon emissions from the transportation sector, making it the main contributor to air pollution and climate change. For this reason, the use of electric vehicles as a green alternative in transporting people from one place to another has immense importance in Indonesia. Indonesia ranks as the tenth largest carbon emitter in the global list with the utilization of fossil fuels as the main source of electricity identified as the main factor in carbon emissions [1]. The passing of the Presidential Regulation No. 55 of 2019 indicates that the Indonesian government is determined to speed up the process of using electric vehicles and strives to build an environmental-friendly vehicle network in Indonesia [2].

Electric vehicles, especially electric motorcycles, have entered the Indonesian market and have found acceptance as an alternative mode of transport. However, adoption rates

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are lower than those of fuel vehicles because of several reasons, including cost and the absence of charging stations [3]. Therefore, it is essential to identify and understand the factors that drive consumer interest in adopting electric motorcycles, so that more effective strategies can be developed to accelerate the transition toward sustainable transportation.

Despite policy support and promotion efforts, the adoption of electric motorcycles in Indonesia remains significantly lower than that of conventional motorcycles. Data from the Asosiasi Industri Sepeda Motor Listrik Indonesia (Aismoli), In 2023 electric motorcycle sales reached only 41,773 units compared with 6.24 million internal combustion engine motorcycles, indicating a substantial gap in market penetration. Although the market has shown gradual growth since 2020 due to stronger government commitment, increasing environmental awareness, and technological advancements, adoption remains limited. This persistent disparity highlights the need to better understand the key factors shaping consumer intentions and behaviors toward electric motorcycle adoption.

Previous literature concerning the adoption of electric vehicles (EVs), especially electric motorcycles, has primarily identified significant influential factors in consumer intention. The performance of the vehicle, including its efficiency, reliability, and maintainability, along with maintenance costs, has appeared as significant influences in consumer buying decisions [4]. Further, consumer attitudes have emerged as important factors in understanding adoption behavior, acting as mediating factors in the influence of several other factors [5].

However, there are significant gaps in the current literature. First, there are few studies that attempt to differentiate and integrate related variables such as vehicle performance and total cost ownership (TCO) with consumers' attitudes [6]. Second, there are studies using relatively simplistic or single-factor analytical methods, which are inadequate to reveal the complex relationships between multiple factors, thereby resulting in insufficiencies in understanding consumer adoption behavior [7]. These factors in all likelihood highly affect consumer adoption patterns.

Inevitably, there arises an urgent need to integrate scientific research concerning vehicle performance and TCO, in addition to consumer attitudes, in order to appropriately model consumer purchase intentions of electric motor bikes. By so doing, there will be an enhanced understanding regarding how these factors interact in terms of complementing or countering consumer behavior. In addition to that, there will be the need to integrate other factors such as the associated context in order to gain useful knowledge in guiding policymakers towards developing appropriate strategies in facilitating the adoption of environmentally friendly vehicles in Indonesia [8]. It can therefore lead to enhanced knowledge regarding the development of marketing strategies that can aid in facilitating the adoption of electric vehicles in Indonesia.

This study contributes to the literature by integrating vehicle performance and total cost ownership within a single framework to explain electric motorcycle adoption. It further examines the mediating role of consumer attitude in translating technical and economic evaluations into purchase intention, an aspect that remains underexplored in prior studies. Empirical evidence on electric motorcycle adoption in emerging markets such as Indonesia is also limited, particularly for two-wheeler electric vehicles that

dominate mobility patterns in Southeast Asia. Therefore, this study investigates how vehicle performance and total cost ownership influence purchase intention toward electric motorcycles, while analyzing the mediating role of consumer attitude. These insights are expected to support the development of policies and marketing strategies that accelerate sustainable mobility adoption in emerging economies.

2 Method

This study employs a quantitative survey approach to analyze the relationships among vehicle performance, total cost ownership, consumer attitude, and purchase intention. The target population consists of Generation Z and Millennial consumers living in urban areas who have interest in purchasing an electric motorcycle.

A purposive sampling technique was used to ensure respondents met the research criteria. Data were collected through an online questionnaire distributed via digital platforms. A total of 200 valid responses were obtained, which satisfies the recommended sample size requirements for Partial Least Squares Structural Equation Modeling (PLS-SEM) [9] .

The variables in this study include vehicle performance, total cost ownership, attitude, and purchase intention. Vehicle performance was measured using indicators such as energy efficiency, acceleration, handling stability, ergonomic design, and battery durability. Total cost ownership was measured through indicators including purchase cost, operational cost, maintenance cost, infrastructure cost, and government incentives. Attitude was measured through perceptions of product quality, economic benefits, and technological attractiveness. Purchase intention was measured using indicators related to perceived value, infrastructure perception, environmental concerns, technological perception, and personal interest.

Data analysis was conducted using PLS-SEM with Smart PLS software. The analysis involved two stages: evaluation of the measurement model and evaluation of the structural model. The measurement model was assessed using indicator reliability, internal consistency reliability, convergent validity, and discriminant validity. The structural model was evaluated through path coefficients, coefficient of determination (R^2), and effect size (f^2). Research model presented in **Fig.1**.

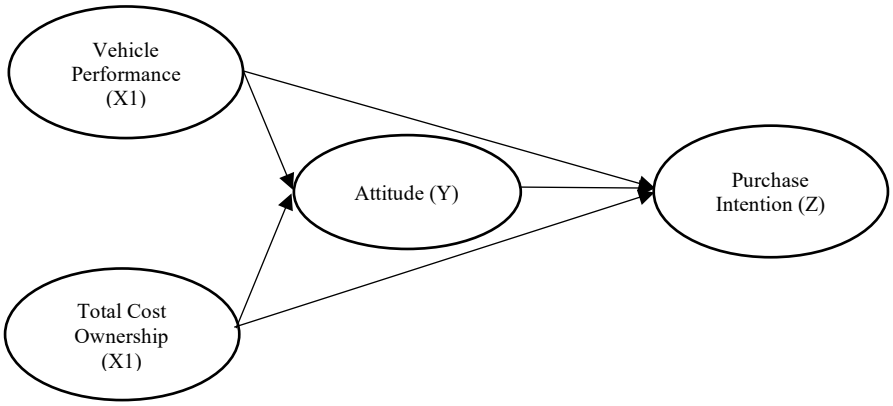

Fig. 1. Research Model

3 Results and discussion

3.1 Results

3.1.1 Respondent Profile

The study involved 200 respondents selected through purposive sampling, with sample characteristics aligned with the research objectives. The sample size followed the guideline proposed by Hair et al. (2022), which recommends a minimum of five to ten times the number of indicators in the model. With 40 indicators employed, the minimum required sample size was 200 respondents (5 × 40), indicating that the sample size was adequate for Partial Least Squares Structural Equation Modeling (PLS-SEM) analysis.

Table 1. Respondent Profile

Category	Description	Frequency
Age	17–20 years	125
	21–24 years	50
	25–28 years	25
Gender	Male	137
	Female	63
Province	DKI Jakarta	60
	Banten	45
	West Java	44
	Central Java	30
	East Java	11
	D.I. Yogyakarta	10

Table 1 summarizes the respondent profile. Most respondents were aged 17–20 years (125), followed by those aged 21–24 years (50) and 25–28 years (25), indicating a predominance of early to mid GenerationZ, a demographic group relevant to consumer decision-making. The sample was dominated by male respondents (137), while female respondents accounted for 63 individuals. In terms of domicile, most respondents resided

in DKI Jakarta (60), followed by Banten (45) and West Java (44), with the remainder from Central Java (30), East Java (11), and D.I. Yogyakarta (10). Overall, the distribution reflects a concentration in Western Java, a region characterized by higher levels of urbanization and access to information, which is relevant to the study context.

3.1.2 Evaluation Measurement Model

Indicator reliability

Indicator reliability was assessed by examining the outer loading values of all indicators. High outer loading values indicate that the indicators share substantial variance represented by the latent variable. Indicators with outer loading values above 0.70 are considered significant and should be retained. For values between 0.40 and 0.70, further evaluation of internal consistency reliability and convergent validity is required. If both criteria meet the threshold, the indicator can be retained; otherwise, it may be removed by considering its impact on substantive validity. Indicators with outer loading values below 0.40 are recommended to be removed [9]. **Table 2** presents the outer loading values for each indicator across constructs.

Table 2. Value of Outer Loading

Variable	Indicators	Outer Loading
Vehicle Performance (X1)	Energy Consumption	0.782
	Acceleration and Maximum Speed	0.790
	Stability and Handling	0.803
	Ergonomic Design	0.794
	Battery Durability and Degradation	0.803
	Performance Biorhythm and Vibration Control	0.712
Total Cost ownership(X2)	Purchase Cost	0.797
	Operational Cost	0.766
	Maintenance Cost	0.749
	Infrastructure Cost	0.729
	Government Incentives	0.785
Attitude (Y)	Positive or Negative View Toward Electric Motorcycles	0.860
	Perceived Economic Benefits	0.826
	Perception of Electric Motorcycle Quality and Reliability	0.846
	Interest in Innovative Technology	0.804
Purchase intention (Z)	Perception of Cost and Financial Value	0.791
	Perception of Infrastructure	0.717
	Environmental Concerns	0.831
	Perception of Technology	0.844
	Perception of Brand and Social Image	0.790
	Personal Interest and Attitudinal Statements	0.766

Variable	Indicators	Outer Loading
	Regulatory and Policy Factors	0.785

Source: SmartPLS Output, 2025

Table 2 shows that the outer loading values for all indicators are greater than 0.70, indicating that all indicators are reliable. Therefore, it can be concluded that the indicator reliability criteria for the measurement model have been fulfilled.

Internal Consistency Reliability

The internal consistency reliability was assessed using Cronbach's Alpha and composite reliability. Both Cronbach's Alpha and composite reliability values between 0.60 and 0.70 are acceptable for exploratory research, while values between 0.70 and 0.90 are considered satisfactory for more advanced studies [9]. **Table 3** presents the results of the measurement model evaluation for internal consistency reliability based on data processed with SmartPLS 3.

Table 3. Evaluation Results of Measurement Model on Internal Consistency Reliability Criteria

Latent Variables (Constructs)	Cronbach Alpha	Composite Reliablity	Result
Vehicle Performance (X1)	0.872	0.872	Reliable
Total Cost Ownership (X2)	0.824	0.828	Reliable
Attitude (Y)	0.854	0.855	Reliable
Purchase Intention (Z)	0.899	0.902	Reliable

Source: SmartPLS Output, 2025

Table 3 shows that both Cronbach's Alpha and composite reliability values are above 0.70 for all variables. Therefore, it can be concluded that all constructs or latent variables have good internal consistency reliability.

Convergent Validity

Convergent validity can be assessed using the Average Variance Extracted (AVE) value. An AVE value of 0.50 or higher indicates that, on average, the construct explains more than half of the variance of its indicators. Therefore, if the AVE value is greater than or equal to 0.50, it can be concluded that the construct or latent variable is valid [9]. **Table 4** presents the results of the measurement model evaluation for the convergent validity criteria based on data processed using SmartPLS 3.

Table 4. Evaluation Results of Measurement Model for Convergent Validity Criteria

Latent Variables (Constructs)	Average Variance Extracted (AVE)	Criteria	Result
Vehicle Performance (X1)	0.610	0.500	Valid
Total Cost Ownership (X2)	0.586	0.500	Valid
Attitude (Y)	0.696	0.500	Valid
Purchase Intention (Z)	0.624	0.500	Valid

Source: SmartPLS Output, 2025

Based on the evaluation of the convergent validity criteria using AVE values shown in **Table 4**, it can be seen that the four variables are valid. Therefore, it can be concluded that these three variables are valid.

Discriminant Validity

Discriminant validity refers to the extent to which a construct is truly distinct from other constructs based on empirical standards. Establishing discriminant validity implies that a construct is unique and captures phenomena not represented by other constructs in the model. The Heterotrait-Monotrait ratio (HTMT) can be used to evaluate discriminant validity. HTMT value ≤ 0.85 indicates excellent discriminant validity (strict criterion), while an HTMT value ≤ 0.90 is still acceptable (liberal criterion) [9]. **Table 5** presents the results of the discriminant validity evaluation based on the HTMT criteria.

Table 5. Heterotrait-monotrait ratio (HTMT)

	Vehicle Performance (X1)	Total Cost Ownership (X2)	Attitude (Y)	Purchase Intention (Z)
Vehicle Performance (X1)				
Total Cost Ownership (X2)	0.724			
Attitude (Y)	0.863	0.832		
Purchase Intention (Z)	0.774	0.892	0.882	

Source: SmartPLS Output, 2025

Based on the Heterotrait-Monotrait Ratio (HTMT) analysis, the correlations between constructs range from 0.724 to 0.892. This indicates that each construct in the model has good discriminant validity and is able to represent conceptually distinct concepts in explaining the intention to purchase electric motorcycles.

3.1.3 Structural Model Evaluation

After confirming that the measurement model is valid and reliable, the structural model is evaluated. Key assessments include collinearity, significance testing, and model strength. Collinearity is checked using VIF values, which should be below 5 (preferably below 3) to avoid substantial effects on the model estimates. **Table 6** shows the Inner VIF Values.

Table 6. Inner VIF Values

	VIF
Vehicle Performance -> Attitude	1.621
Vehicle Performance -> Purchase intention	2.350
Total Cost Ownership -> Attitude	1.621
Total Cost Ownership -> Purchase intention	2.067
Attitude -> Purchase intention	2.881

Source: SmartPLS Output, 2025

Based on **Table 6**, it can be concluded that none of the VIF values for the variable vehicle performance, total cost ownership, attitude, and purchase intention exceed 5, and all values are below 3. This indicates that there is no collinearity in the structural model and confirms that collinearity does not have a substantial effect on the structural model estimates.

Path coefficient testing can be conducted using t-statistics or p-values from the path coefficients obtained through bootstrapping. The testing criteria are as follows: if the absolute t-statistic value is greater than the critical t-value of 1.96 (two-tailed) or the p-value is less than the significance level (α) of 5%, the null hypothesis (H0) is rejected. In this study, the path coefficient test was performed to examine both the direct and indirect effects of vehicle performance and total cost ownership on purchase intention through attitude. **Table 7** presents the results of the direct effect tests, while **Table 8** presents the results of the indirect effect tests.

Table 7. Testing The Indirect Effect Path Coefficient

Hypothesis	coefficient value	t-statistic	P values	Result
Vehicle Performance -> Attitude	0.503	7.687	0.000	Significant
Vehicle Performance -> Purchase intention	0.160	1.770	0.077	Not Significant
Total Cost Ownership -> Attitude	0.393	5.597	0.000	Significant
Total Cost Ownership -> Purchase intention	0.420	3.986	0.000	Significant
Attitude -> Purchase intention	0.360	3.936	0.000	Significant

Source: SmartPLS Output, 2025

The results indicate that *vehicle performance* has a significant positive effect on *attitude* but does not directly influence *purchase intention*. Meanwhile, *total cost ownership* significantly affects both *attitude* and *purchase intention*. Finally, *attitude* significantly influences *purchase intention*, highlighting its role as a mediating factor in the interest to purchase of electric motorcycles.

The strength of the structural model can be assessed using the coefficient of determination (R^2), which indicates how much variance in the dependent variable is explained by the independent variables. A model is considered substantial or strong if $R^2 \geq 0.75$, moderate if $0.25 < R^2 < 0.75$, and weak if $R^2 \leq 0.25$.

Table 8. R-square Value

	R-square
Attitude	0.653
Purchase intention	0.713

Source: SmartPLS Output, 2025

Based on **Table 8**, the R^2 for *attitude* is 65.3%, indicating a moderate model, meaning that 65.3% of the variance in *attitude* is explained by *vehicle performance and total cost ownership*, while the remainder is influenced by other factors. The R^2 for *purchase intention* is 71.3%, also indicating a moderate model, with variance explained by *vehicle performance, total cost ownership and attitude*.

In addition to R^2, model strength can be evaluated using effect size (f^2), which measures the change in R^2 to determine the substantive impact of exogenous latent variables on endogenous latent variables [9]. Effect size values of 0.02, 0.15, and 0.35 indicate weak, moderate, and strong effects, respectively, while values below 0.02 indicate no effect.

Table 9. F-square Values

	Vehicle Performance (X1)	**Total Cost Ownership (X2)**	**Attitude (Y)**	**Purchase Intention (Z)**
Vehicle Performance (X1)			0.450	0.038
Total Cost Ownership (X2)			0.275	0.297
Attitude (Y)				0.157
Purchase Intention (Z)				

Source: SmartPLS Output, 2025

In the model, the f^2 value for the effect of vehicle performance on attitude is 0.450, indicating a strong effect. The effect of vehicle performance on purchase intention has an f^2 of 0.038, indicating a small effect. Then, total cost ownership on attitude is 0.275, indicating a moderate effect. The effect of total cost ownership on purchase intention has an f^2 of 0.297, indicating a moderate effect. Lastly, the effect of attitude on purchase intention has an f^2 of 0.157, indicating a moderate effect.

4 Discussion

From this study, the integration between vehicle performance, total cost ownership (TCO), attitude, and purchase intention in electric motorcycles is made clear. Vehicle performance is seen to play an important role in consumer attitude and consumer interest in the purchase of electric motorcycles, showing that attitude can positively contribute to increased consumer interest in purchase, yet it is not the motivating factor for this process [10]. Total cost ownership, on the other hand, is seen to play an important role in determining attitude and consumer interest in the purchase of electric motorcycles,

showing the role of cost in consumer attitude and increased interest in electric motorcycles [11], Consumer preferences are seen to be focused on cost-saving benefits of such vehicles, such as lower operating and maintenance costs, increasing consumer receptiveness towards purchasing electric vehicles [12].

The attitude factor as an important predictor for interest in the purchase of new technologies is in line with behavioral theories, especially the Theory of Planned Behavior (TPB). Here, attitude is seen as an important mediator that bridges the gap between the point of interest and the eventual point of behavioral action. Evidence suggests that having a desirable attitude can yield better results in the intention to use different technologically-enabled services like mobile wallets and internet payment systems [13]. In this case, it confirms that attitude is indeed an important factor that can push behavioral intentions towards increased technological adoption, thus justifying its role in technological mediations [5]. In this case, it can be seen that favorable attitudes towards any given product work to spread consumer motivations for technological use, thus reiterating the role that needs to be played in making certain that consumer attitude towards any given technological phenomenon turns out to be favorable [14].

The findings from this analysis have important implications for understanding consumer behavior in the context of electric vehicle purchase intention. The high R^2 values (65.3% variations in attitude and 71.3% variations in purchase intention indicate that these models are moderately strong. The effect size analysis further shows that while there is a highly significant impact of vehicle performance on attitude, its direct effect on purchase intention is relatively weak, indicating effective mediation by attitude. In contrast, total cost ownership is seen to have moderate effects on attitude as well as purchase intention, reinforcing an economic dimension to consumers' choices. Moreover, attitude has a moderate effect on purchase intention, which is useful to note when interpreting various established behavioral theories that place attitude as a key determinant of behavioral intention, especially for new technology adoption [15].

These findings provide several implications for policymakers and industry stakeholders. Improving the perceived performance of electric motorcycles through technological innovation can strengthen consumer confidence in electric mobility. Government incentives that reduce the total cost of ownership may significantly increase consumer intention to adopt electric motorcycles. In addition, public awareness campaigns highlighting the economic and environmental benefits of electric motorcycles may strengthen positive attitudes and accelerate sustainable mobility adoption. The findings also reinforce theoretical models emphasizing attitude as the core in shaping behavioral intentions, especially in the context of environmentally friendly technologies.

5 Conclusion

Results indicate that vehicle performance and total cost ownership are the key drivers of consumers' intention to purchase electric motorcycles, while attitude plays an essential mediating role. Whereas vehicle performance affects purchase intention only indirectly by attitude, total cost ownership drives intention both directly and indirectly, underlining the relevance of economic considerations. Attitude is a strong predictor of purchase intention, and the model shows a moderate explanatory power overall. In

general, improving consumer perceptions about performance and offering lower ownership costs are the main strategies to be followed when trying to speed up electric motorcycle diffusion in emerging markets.

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