Factors affecting student's purchase intension on innovative electric motorcycles in Bangkok and surrounding areas

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Abstract: This research investigates the impact of three core factors—namely, product innovation characteristics, perceived value, and individual attitude—on the intention of university students in Bangkok and surrounding areas to purchase electric motorcycles. Additionally, the study aims to construct a structural equation model (SEM) illustrating the relationships among these variables. A quantitative approach was adopted, employing a structured questionnaire to collect data from 240 university students who had experience in motorcycle purchasing. A two-stage sampling method, including quota and purposive sampling, was applied. The data were analyzed using descriptive statistics, confirmatory factor analysis (CFA), and structural equation modeling (SEM). The findings revealed that product innovation characteristics, perceived value, and attitude each had a statistically significant and positive direct effect on purchase intention. Moreover, both product innovation and perceived value indirectly influenced purchase intention through the mediating role of attitude. Among these factors, product innovation characteristics exhibited the strongest total influence, followed by perceived value and attitude. An effective product innovation strategy that aligns with consumer values and nurtures positive attitudes is crucial in boosting students' purchase intention. These insights provide actionable recommendations for manufacturers and marketers of electric motorcycles aiming to target young urban consumers. The research advances understanding in the field of consumer behavior toward sustainable transport, particularly electric motorcycles. By integrating innovation, value perception, and attitude within a cohesive model, the study offers a practical framework for addressing purchase behavior in a growing market segment.

Keywords: Consumer attitude, Electric motorcycles, Perceived value, Product innovation, Purchase intention.

1. Introduction

Thailand is one of the countries with the highest motorcycle usage. As of 2023, there were 22,490,455 registered motorcycles nationwide [1]. Most of these motorcycles still rely on internal combustion engines (ICEs), which use fossil fuels as their primary energy source. The combustion process emits pollutants such as carbon monoxide (CO) and particulate matter into the atmosphere. It is estimated that motorcycles in Thailand emit approximately 18 million tons of carbon dioxide annually. To absorb this volume of CO_2, it would require around 3 billion large trees (over 6 meters in height) [1].

In response to increasing environmental concerns and energy consumption, the Thai government has implemented measures to promote the adoption of electric vehicles, specifically electric motorcycles. According to the National Electric Vehicle Policy Committee, manufacturers participating in the government incentive program are eligible for benefits, including a reduced excise tax of 1% and a direct subsidy of 18,000 THB per unit for battery electric motorcycles (BEVs) imported during 2022–2023 and domestically produced during 2022–2025 [2]. Concurrently, private sector innovation and

technological advancement have made electric motorcycles increasingly competitive compared to hybrid motorcycles and internal combustion engine motorcycles, particularly in terms of energy cost, maintenance, and emissions.

These factors have contributed to the rapid growth in the popularity of electric motorcycles in daily life. In 2023, 1,878,655 motorcycles were registered, of which 21,841 were electric motorcycles, a significant increase from just 7,302 units in 2022 [1].

Given this context, the researcher is interested in studying the factors influencing university students' intention to purchase electric motorcycle innovations in Bangkok and its metropolitan area. The aim is to identify variables that have direct, indirect, and overall effects on purchase intention. The findings are expected to provide practical guidance for electric motorcycle manufacturers and distributors to improve business efficiency. Additionally, the results may assist government agencies in developing policies that support the adoption of high-efficiency and environmentally friendly products. Private sector stakeholders, particularly motorcycle businesses, can also utilize the results to design effective strategies in product development, marketing, and service delivery.

1.1. Research Objectives

1. To examine the influence of innovative product characteristics, perceived consumer value, and attitude on the purchase intention of electric motorcycle innovations among university students in Bangkok and its metropolitan areas.

2. To develop a structural equation model (SEM) representing the influence of innovative product characteristics, perceived consumer value, and attitude on the purchase intention of electric motorcycle innovations among university students in Bangkok and its metropolitan areas.
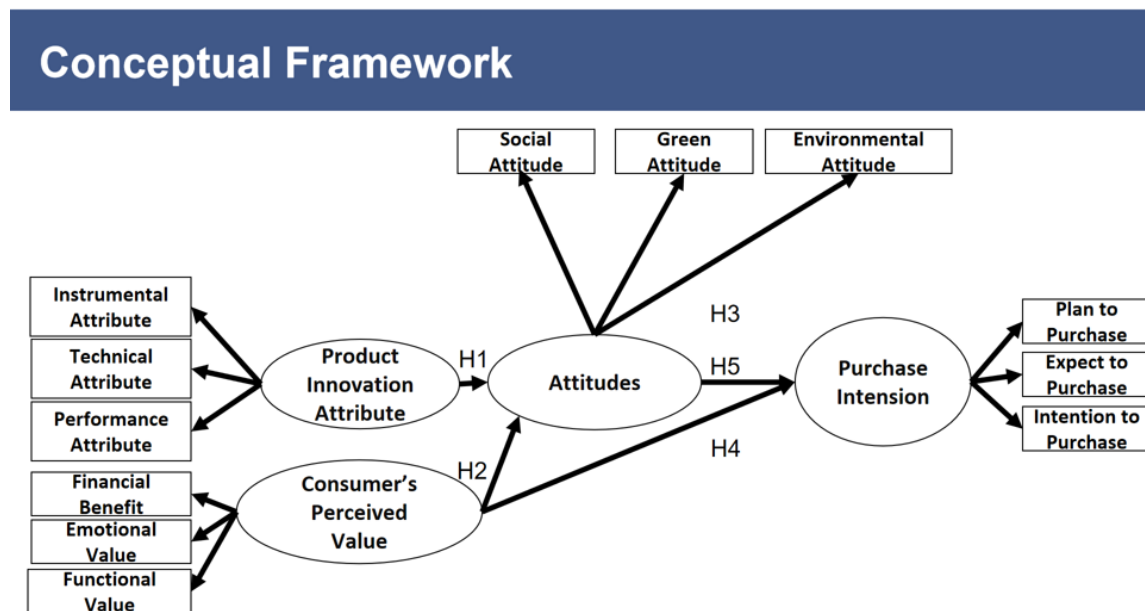

Figure 1.
Conceptual Framework.
Source: Zhuang, et al. [3] and Muminovich [2].

1.2. Research Variables

The variables studied in this research are classified into two main types as follows:

1. Exogenous Latent Variables (Independent Variables): Innovative Product Characteristics, comprising product attributes, performance attributes, and technical attributes. Perceived Consumer Value, comprising perceived benefits, perceived ease of use, and performance expectations.
2. Mediator Variable: Attitude, comprising social influence, green product perception, and environmental concern.
3. Endogenous Latent Variable (Dependent Variable): Purchase Intention, comprising planning to purchase, expecting to purchase, and intending to purchase.

2. Research Methodology

This study employed a quantitative research approach to examine the factors influencing students' purchase intention toward electric motorcycles. The target population comprised university students in Bangkok and its surrounding provinces, totaling 1,063,774 individuals in 2023. The sample consisted of 240 students who had made purchasing decisions related to electric motorcycles, selected through a two-stage sampling process: quota sampling based on institution type and purposive sampling of eligible respondents. The sample size was calculated based on 20 times of 12 observed variables [4].

Data were collected by a questionnaire and analyzed using descriptive statistics, confirmatory factor analysis (CFA) and SEM. Model fit was evaluated by Chi-square/df, GFI, RMSEA, and p-value and it is refined to align with empirical data and theoretical foundations.

3. Results

3.1. Results of Confirmatory Factor Analysis

Table 1.
Correlation values of observed variables in innovative product characteristics components.

Observed Variables	Correlation Coefficient Value		
	PA1	PA2	PA3
PA1	1		
PA2	0.62**	1	
PA3	0.77**	0.62**	1

Note: Remark: **p<0.01.

This demonstrates that the correlations among the three observed variables are statistically significant at the 0.01 level. Each pair of variables shows a positive relationship, with correlation coefficients ranging from 0.62 to 0.77. As all coefficients remain below the commonly accepted threshold of 0.80, the correlations are not deemed excessively high. This suggests that while the variables are positively associated, their relationships remain within an acceptable and non-redundant range for analysis.
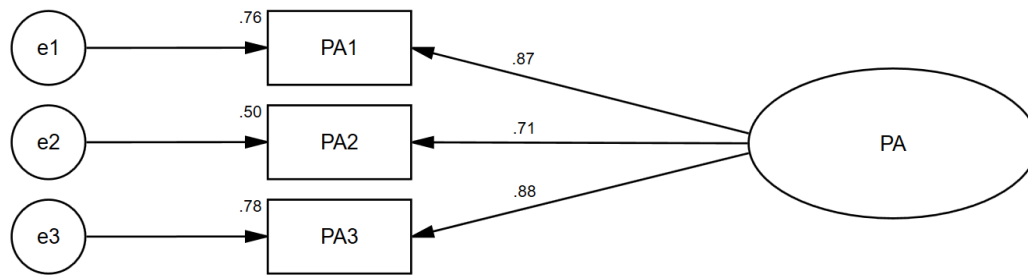
Chi-square=.000; df=0; relative chi-square=1.00; p=1.00
;RMSEA=.000; RMR=.000; GFI=1.000;AGFI=1.000

Figure 2.
Component Model of the Variable: Product Innovation Attribute.

Table 2.
Standardized Factor Loadings, Construct Reliability, and Average Variance Extracted of Product Innovation Attribute

Latent Variables	AVE	CR	Observed Variables	Standardized Factor Loading	R^2
Product Innovation Attribute	0.68	0.86	Instrumental Attribute (PA1)	0.87	0.76
			Performance Attribute (PA2)	0.71	0.5
			Technical Attribute (PA3)	0.88	0.78

The latent variable Product Innovation Attribute (PA) demonstrates strong validity and a good fit with the empirical data. All fit indices meet the acceptable thresholds, indicating a perfect model.

3.2. Results of the Construct Validity Test for the Model of Consumer's Perceived Value

Table 3.
Correlation Coefficients of Observed Variables in the Construct of Consumer's Perceived Value.

Observed Variables	Correlation Coefficients Value		
	PV1	PV2	PV3
PV1	1		
PV2	0.57**	1	
PV3	0.76**	0.59**	1

Note: Remark: **$p<0.01$.

This shows that correlation coefficients among the three observed variables indicate that all three variable pairs have statistically significant correlations at the 0.01 level. The correlation coefficients are positive, ranging from 0.57 to 0.76. As all coefficients remain below the commonly accepted threshold of 0.80, the correlations are not deemed excessively high. This suggests that while the variables are positively associated, their relationships remain within an acceptable and non-redundant range for analysis.
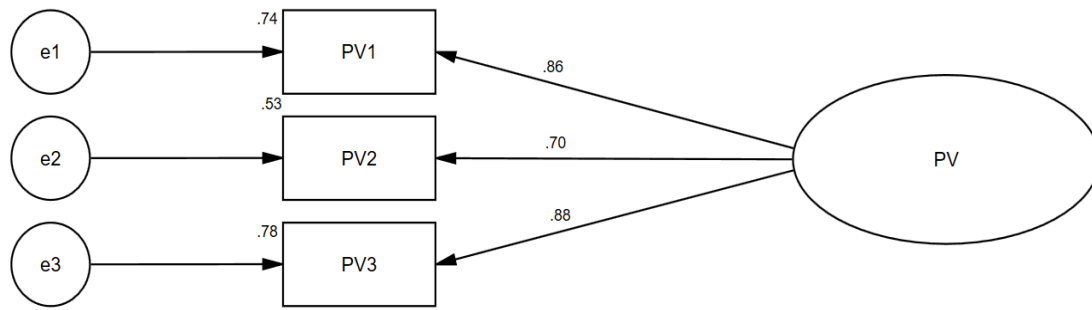
Chi-square=.000; df=0; relative chi-square=\cmindf; p=\p
;RMSEA=\rmsea; RMR=.000; GFI=1.000;AGFI=\agfi

Figure 3.
Component model of Consumer's Perceived Value variables.

Table 4.
Standardized Factor Loading Construct Reliability and Average Variance Extracted Consumer's Perceived Value Variables.

Latent Variables	AVE	CR	Observed Variables	Standardized Factor Loading	R^2
Consumer's Perceived Value	0.66	0.85	Instrumental Attribute (PV$_1$)	0.86	0.74
			Performance Attribute (PV$_2$)	0.7	0.53
			Technical Attribute (PV$_3$)	0.88	0.78

It shows that the Consumer's Perceived Value (PV) variable demonstrates strong validity and a good fit with the empirical data. All fit indices meet the acceptable thresholds, indicating a perfect model.

3.3. Results of the Validity Test of the Attitude Model

Table 5
Correlation Coefficients Value of Observed Variables in Attitude Components.

Observed Variables	Correlation Coefficients Value		
	AT1	AT2	AT3
AT1	1		
AT2	0.59**	1	
AT3	0.66**	0.55**	1

Note: Remark: **p<0.01.

It shows that the correlation values between all three pairs of Observed Variables were significantly different from zero at the 0.01 level for all pairs, with a positive correlation value and a correlation coefficient between 0.55 and 0.66. As all coefficients remain below the commonly accepted threshold of 0.80, the correlations are not deemed excessively high. This suggests that while the variables are positively associated, their relationships remain within an acceptable and non-redundant range for analysis.
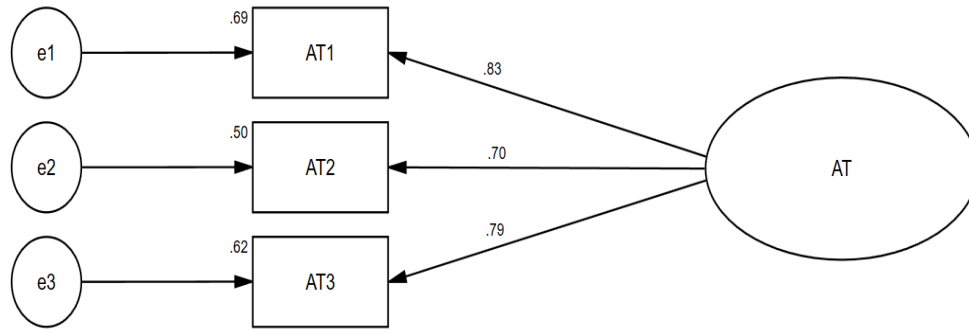
Chi-square=.000; df=0; relative chi-square=1.00; p=1.00
;RMSEA=.000; RMR=.000; GFI=1.000;AGFI=1.000

Figure 4.
Composition model of attitude variables.

Table 6.
Standardized Factor Loading Construct Reliability and Average Variance Extracted of attitude variables.

Latent Variables	AVE	CR	Observed Variables	Standardized Factor Loading	R²
Attitude	0.6	0.82	Social Attitude (AT1)	0.83	0.69
			Green Attitude (AT2)	0.7	0.5
			Environmental Attitude (AT3)	0.79	0.62

It shows that the confirmatory factor model of the latent variable Attitude (AT) demonstrates strong validity and a good fit with the empirical data. All fit indices meet the acceptable thresholds, indicating a perfect model.

3.4. Results of the Structural Validity Test of the Intention to Purchase Model

Table 7.
Correlation Coefficients Value of Observed Variables in the Intention to Purchase component.

Observed Variables	Correlation Coefficients Value		
	AT1	AT2	AT3
AT1	1		
AT2	0.63**	1	
AT3	0.78**	0.68**	1

Note: Remark: **p<0.01

It shows that the Correlation Coefficients Value consisted of 3 Observed Variables. The results showed that the correlation values between all 3 pairs of Observed Variables were significantly different from zero at the 0.01 level for all pairs, with a positive correlation value and a correlation coefficient between 0.63 and 0.78. As all coefficients remain below the commonly accepted threshold of 0.80, the correlations are not deemed excessively high. This suggests that while the variables are positively associated, their relationships remain within an acceptable and non-redundant range for analysis.
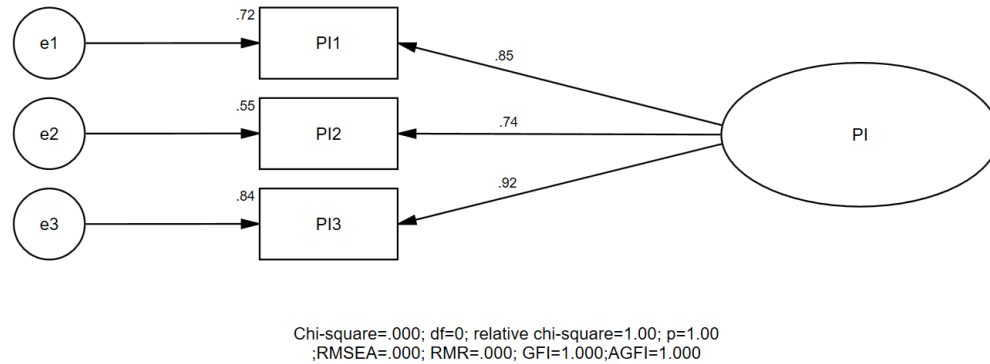
Chi-square=.000; df=0; relative chi-square=1.00; p=1.00
;RMSEA=.000; RMR=.000; GFI=1.000;AGFI=1.000

Figure 5.
Component Model of Intention to Purchase Variables.

Table 8.
Standardized Factor Loading Construct Reliability and Average Variance Extracted of Intention to Purchase Variables.

Latent Variables	AVE	CR	Observed Variables	Standardized Factor Loading	R²
Intention to Purchase	0.71	0.88	Plan to Purchase (PI1)	0.85	0.72
			Expect to Purchase (PI2)	0.74	0.55
			Intend to Purchase (PI3)	0.92	0.84

It shows that the confirmatory component model of the variable Intention to Purchase (PI) demonstrates strong validity and a good fit with the empirical data. All fit indices meet the acceptable thresholds, indicating a perfect model.

3.5. Results of the Analysis of the Relationship Between Latent Variables

The relationship between 4 latent variables found that the relationship between all pairs of variables was greater than zero with significance level at .01, indicating that the correlation coefficient between the variables was positively related or in the same direction and ranged from 0.05 to 0.43. The correlation matrix of the observed variables used in the research was not an identity matrix and had a relationship between the variables sufficient to be used for factor analysis to check the structural validity or analyze the structural equation model, as shown in Table 9.

Table 9.
Correlation of Latent Variables in Structural Equation Model of Factors Influencing Intention to Purchase Electric Motorcycle Innovation of Students in Bangkok and its Surrounding Areas.

Latent Variables	PA	PV	AT	PI
Product Innovation Attribute (PA)	1.00			
Consumer's Perceived Value (PV)	0.70**	1.00		
Attitude (AT)	0.58**	0.56**	1.00	
Intention to Purchase (PI)	0.70**	0.67**	0.60**	1.00
KMO : Measure of Sampling Adequacy = 0.939				
Bartlett's Test of SpheriATty : Chi-Square = 2711.789, df = 66, p = .000				

Note: Remark: **Sig. < 0.01.

3.6. Results of the Development of the Causal Relationship Model

From the analysis of the basic data of Observed Variables, the confirmatory components of Latent Variables, and the relationship between Latent Variables, it was found that it is appropriate to bring Observed Variables and Latent Variables into the structural equation. And the researcher has developed and adjusted the model until it meets the standard according to the criteria. And in the final model, it

was found that the results of the analysis of the accuracy of the structural equation model of the factors affecting the Intention to Purchase Electric Motorcycle Innovation of students in Bangkok and its vicinity And the influence value between the variables in the model by the influence analysis method with Latent Variables And using the criteria for the goodness of fit statistics [5] have the standard values according to the criteria for the statistical value of the fit.

From the examination of the structural equation model of the Intention to Purchase Electric Motorcycle Innovation of students in Bangkok and its vicinity, it was found that the structural equation model of Intention to Purchase of Electric Motorcycle Innovation of Students in Bangkok and its vicinity is not consistent with empirical data. Therefore, the researcher adjusted the model.

Table 10.
Results of the analysis on the validity and factor loadings of the structural equation model of Intention to Purchase electric motorcycle innovations among university students in Bangkok and its metropolitan area after model modification.

Latent Variables	Observed Variables	Standardized Factor Loading			
		b_{sc}	SE	t	precision (R^2)
PA	PA1	0.78**	<-->	<-->	0.6
	PA2	0.80**	0.07	14.52	0.64
	PA3	0.80**	0.06	18.38	0.63
PV	PV1	0.72**	<-->	<-->	0.51
	PV2	0.77**	0.08	12.64	0.6
	PV3	0.76**	0.06	16.94	0.58
AT	AT1	0.78**	<-->	<-->	0.61
	AT2	0.82**	0.07	14.04	0.67
	AT3	0.84**	0.06	13.45	0.68
PI	PI1	0.79**	<-->	<-->	0.62
	PI2	0.80**	0.06	15.02	0.63
	PI3	0.77**	0.05	19.31	0.59

Chi-Square = 49.56, df = 35, c^2/ df = 1.42, RMSER = 0.04, RMR = 0.01, GIF = 0.97, AGIF = 0.93

Latent Variables	Observed Variables	Standardized Factor Loading			
		b_{sc}	SE	t	Precision (R^2)
PA	PA1	0.78**	<-->	<-->	0.60
	PA2	0.80**	0.07	14.52	0.64
	PA3	0.80**	0.06	18.38	0.63
PV	PV1	0.72**	<-->	<-->	0.51
	PV2	0.77**	0.08	12.64	0.60
	PV3	0.76**	0.06	16.94	0.58
AT	AT1	0.78**	<-->	<-->	0.61
	AT2	0.82**	0.07	14.04	0.67
	AT3	0.84**	0.06	13.45	0.68
PI	PI1	0.79**	<-->	<-->	0.62
	PI2	0.80**	0.06	15.02	0.63
	PI3	0.77**	0.05	19.31	0.59

Chi-Square = 49.56, df = 35, χ^2/ df = 1.42, RMSER = 0.04, RMR = 0.01, GIF = 0.97, AGIF = 0.93

Note: Remark: **$p<0.01$, b_{sc} =Standardized Factor Loading <--> = the parameter is constrained, the standard error (SE) and t-value are not reported.

From Table 10, it was found that the developed Intention to Purchase equation model of electric motorcycle innovation of students in Bangkok and its vicinity has accuracy because the model has a good fit with empirical data.

Table 11.
Standard coefficient of influence in the structural equation model of factors affecting the intention to purchase electric motorcycle innovation of students in Bangkok and its vicinity.

Dependent Variables	R²	Influence	Independent Variables		
			PA	PV	AT
AT	0.68	DE	0.57**	0.47**	-
		IE	-	-	-
		TE	0.57**	0.47**	-
PI	0.82	DE	0.43**	0.37**	0.25**
		IE	0.47**	0.12**	-
		TE	0.90**	0.49**	0.25**

Note: Remark: **Sig. < .01.

DE = Direct effect, IE = Indirect effect, TE =Total effect,– no parameter line according to the research hypothesis.

From Table 11, all causal variables in the model have a positive influence on the variable Intention to Purchase Electric Motorcycle Innovation of Students in Bangkok and its vicinity, which can jointly explain the variance of the factors that influence Intention to Purchase Electric Motorcycle Innovation of Students in Bangkok and its vicinity (PI) (R²) by 82%. When considering the total influence on the variable Intention to Purchase Electric Motorcycle Innovation of Students in Bangkok and its vicinity, it was found that the variable Product Innovation Attribute has a total influence size of 0.90, followed by the variable Consumer's Perceived Value with a total influence size of 0.49, and the variable Attitude. The total influence size was 0.25. When considering the total influence on the Attitude variable of students in Bangkok and its vicinity, it was found that the Product Innovation Attribute variable had the highest total influence size, equal to 0.90, followed by Consumer's Perceived Value, with a total influence size of 0.47. Each causal variable had a causal relationship and influence value on Intention to Purchase Electric Motorcycle Innovation of students in Bangkok and its vicinity, ranked from most to least, as follows:

1) Product Innovation Attribute (PA) is a Late Variable that has a positive influence on Intention to Purchase Electric Motorcycle Innovation and has the highest total influence size, ranked first. It is divided into direct influence, significant level at .01 , with an influence value of 0.43, and indirect influence, statistically significant at the .01 level, with an influence value of 0.47, with a total influence size of significant level at .01 , with an influence value of 0.90.

2) Consumer's Perceived Value (PV) is a Late Variable that has a positive influence on Intention to Purchase Electric Motorcycle Innovation. And the total influence size is ranked second, divided into direct influence, significant level at .01 , with an influence value of 0.37, and indirect influence, significant level at .01 , with an influence value of 0.12, with a total influence size significant level at .01 , with an influence value of 0.49. 3) Attitude (AT) variable is a latent variable that has the most positive influence on Intention to Purchase electric motorcycle innovation, and has the third highest total influence size, which is only the direct influence. At significant level at .01 , the influence value was 0.25.

In addition to the direct and indirect influences affecting the Intention to Purchase Electric Motorcycle Innovation (PI), other variables were directly influenced, namely the Attitude (AT) variable, which was directly influenced by the Product Innovation Attribute (PA) variable and the Consumer's Perceived Value (PV) variable, at a statistical significance level of .01, with a combined influence size of 0.57 and 0.47, respectively.

From the development of the structural equation model of the Intention to Purchase Electric Motorcycle Innovation of students in Bangkok and its vicinity, it was found that the Product Innovation Attribute (PA) variable was the factor that had the greatest impact on the Intention to Purchase Electric

Motorcycle Innovation of students in Bangkok and its vicinity, followed by the Consumer's Perceived Value (PV) variable and the Attitude (AT) variable, respectively, as shown in Figure 6.
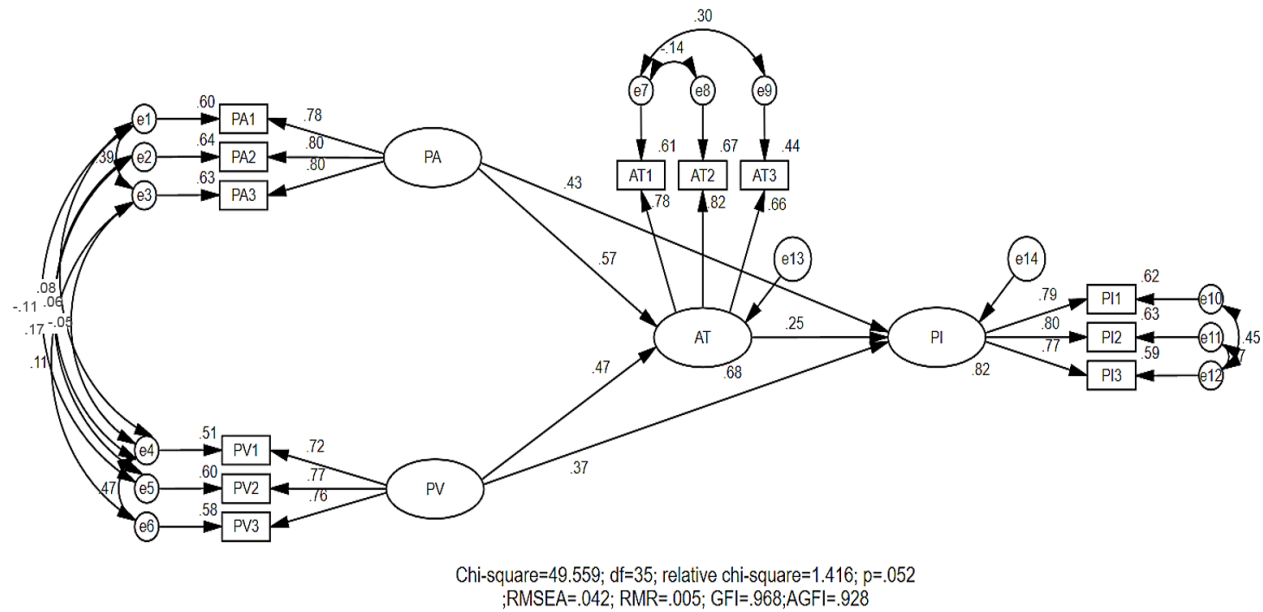

Chi-square=49.559; df=35; relative chi-square=1.416; p=.052
;RMSEA=.042; RMR=.005; GFI=.968;AGFI=.928

Figure 6.
Structural equation model of factors affecting intention to purchase electric motorcycle innovation of students in Bangkok and its vicinity after model revision 10.

From the structural equation analysis of Product Innovation Attribute, Product Innovation Attribute, Attitude, Consumer's Perceived Value, and Intention to Purchase of Electric Motorcycle Innovation of students in Bangkok and its vicinity, the researcher found that the analysis results revealed the statistical significance level of each variable in the conceptual framework. Therefore, the researcher summarized the results of the research hypothesis testing as shown in Table 12.

Table 12.
Results of research hypothesis testing.

Hypothesis	Path coefficients	P-value	Results
H1: Product Innovation Attribute has direct influence to Attitude	0.57**	0.00	Accept
H2: Consumer's Perceived Value has direct influence to Attitude	0.47**	0.00	Accept
H3: Product Innovation Attribute has direct influence to Intention to Purchase	0.43**	0.00	Accept
H4: Consumer's Perceived Value has direct influence to Intention to Purchase	0.37**	0.00	Accept
H5: Attitude has direct influence to Intention to Purchase	0.25**	0.01	Accept

Note: Remark: **Sig. < .01.

The analysis of the structural equation model, after adjustments, showed that the model aligns well with the empirical data. This is supported by several fit indices meeting acceptable thresholds: the chi-square/df ratio (CMIN/DF) was 1.98 (less than 3.00), the Goodness of Fit Index (GFI) was 0.93, the Comparative Fit Index (CFI) was 0.97, and the Root Mean Square Error of Approximation (RMSEA) was 0.049—all of which are within standard guidelines for model fit.   Furthermore,   the   results indicated that all proposed hypotheses were supported. Specifically:

Product innovation characteristics had a significant and positive direct effect on students' purchase intention of electric motorcycles (standardized coefficient = 0.42, p < 0.01).

Perceived value also had a significant positive influence (standardized coefficient = 0.35, p < 0.01).

Attitude demonstrated a strong and direct effect on purchase intention (standardized coefficient = 0.31, p < 0.01).

In addition to direct effects, the study found that both product innovation characteristics and perceived value indirectly influenced purchase intention through attitude as a mediating variable. The total effect (including direct and indirect influences) showed that product innovation exerted the greatest overall impact (total effect = 0.58), followed by perceived value (total effect = 0.49), and attitude (total effect = 0.31).

These results suggest that students' purchase intentions are shaped not only by how innovative they perceive the product to be but also by their personal values and attitudes toward electric motorcycles. The interaction of these factors plays a crucial role in predicting consumer behavior in the electric motorcycle market among young urban populations.

4. Conclusion

Research objective 1: What factors influence the purchase intention of electric motorcycle innovation of students in Bangkok and its vicinity? It was found that

1. Innovative product characteristics have a direct influence on purchase intention.

2. Innovative product characteristics have an indirect influence through mediating attitudes affecting purchase intention.

3. Consumer perceived value has a direct influence on purchase intention.

4. Consumer perceived value has an indirect influence through mediating attitudes affecting purchase intention.

5. Attitude has a direct influence on purchase intention.

Research objective 2: Develop a linear structural equation model of the influence of innovative product characteristics, consumer perceived value, and attitude on purchase intention of electric motorcycle innovation of students in Bangkok and its vicinity. It was found that the structural equation model of purchase intention of electric motorcycle innovation of students in Bangkok and its vicinity is consistent with the theory. The observed variables had component weight values between 0.72 - 0.82 and the latent variables had reliability values between 0.51 - 0.64 and the structural equation analysis (Chi-Square = 49.56, df = 35, RMSEA = 0.04 and RMR = 0.01, GFI = 0.97 and AGFI = 0.93, χ^2 / df = 1.42)

5. Discussion

The findings of this study highlight that product innovation characteristics, perceived value, and attitude all play significant roles in shaping university students' intentions to purchase electric motorcycles in Bangkok and its surrounding areas. These results reinforce the notion that consumers, particularly in the student demographic, are increasingly influenced by how innovative a product appears, especially in terms of design, technology, usability, and environmental impact.

The strong influence of product innovation aligns with previous research suggesting that innovations in electric vehicle design and features can directly enhance consumer interest and intention to adopt such products [6, 7]. In this study, innovation not only exerted the highest direct effect but also significantly influenced students' attitudes, which in turn contributed to their purchase intentions. This underscores the importance of innovative attributes such as battery performance, smart features, and modern aesthetics in shaping positive consumer perceptions.

Perceived value also emerged as a key determinant. Students are not only price-conscious but also evaluate electric motorcycles based on the balance between cost, environmental benefits, and functional

advantages. When they perceive the product to deliver worthwhile benefits relative to its cost, their willingness to purchase increases. This supports prior findings that perceived value bridges the gap between product features and actual consumer behavior [3, 8].

Furthermore, attitude plays both a direct and mediating role in the model. A favorable attitude enhances the impact of innovation and value perceptions on purchase intention. This reinforces the Theory of Planned Behavior, which posits that attitude is a strong predictor of behavioral intention [9].

Overall, the study affirms that integrating technological innovation, value-based marketing, and attitude shaping strategies can significantly improve the effectiveness of campaigns targeting young, urban consumers considering sustainable transport alternatives like electric motorcycles.
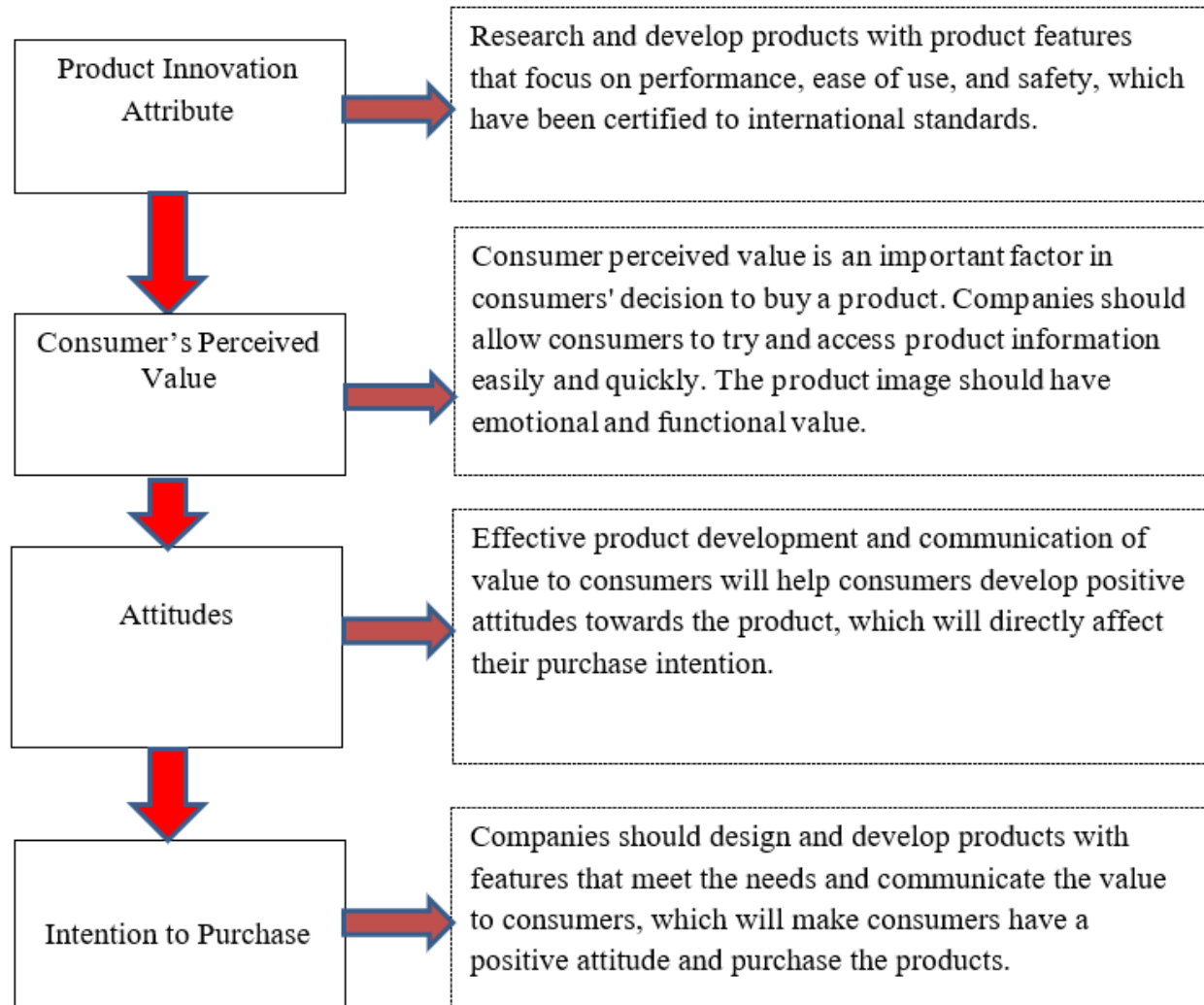

Figure 7.
Structural equation modeling findings on electric motorcycle purchase intention.

5.1. Implications

Based on the findings of this study, electric motorcycle businesses in Thailand can utilize the results to develop strategic plans related to product innovation and marketing in order to enhance consumer purchase intention. The key implications are as follows:

1. Invest in research and development to create innovative products that meet consumer needs, ensuring high quality and international standards.

2. Develop marketing plans that emphasize product uniqueness through advertising and product demonstration activities, allowing consumers to test products firsthand. These activities can raise consumer awareness and increase willingness to adopt electric motorcycles.

5.2. Research Limitations
1. This is a quantitative study that collected data online. Given that electric motorcycles are a relatively new product, most participants lacked real-life usage experience. Respondents were introduced to the product via documents and videos created by the researcher.

2. Data was collected solely from students in the Bangkok Metropolitan Region using a 5-point Likert scale questionnaire. Therefore, participants may not have fully expressed their genuine feelings. Future studies should apply a mixed-methods approach to obtain deeper insights through qualitative data.

5.3. Academic Recommendations
1. The study revealed that the product innovation attribute has the highest total influence (0.90) on the purchase intention of solar-powered air conditioners among Thai SMEs. This is a novel contribution as prior studies have not addressed this. Moreover, product innovation indirectly influences purchase intention through attitude. Future researchers can build upon this model to enhance knowledge in the electric motorcycle industry.
2. The results confirm that product innovation attributes influence both directly and indirectly the intention to purchase electric motorcycles. These findings can guide business development in promoting eco-friendly innovation.
3.

5.4. Practical Recommendations
1. In Thailand's competitive market, businesses should develop electric motorcycles with distinctive innovation features that match consumer demands.
2. Launch new products with strong emphasis on communication, highlighting unique features through advertising and hands-on demonstrations to stimulate consumer awareness and willingness to purchase.
3.

5.5. Recommendations for Future Research
Future studies should incorporate qualitative methods, such as in-depth interviews, to further explore the influence of product innovation attributes and gather richer data on factors affecting purchase intentions.

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