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Price, Maintenance Cost, Infrastructure Readiness, and Attitude: An Integrated Model of Electric Vehicle (EV) Purchase Intention

Nor Azila Mohd Noor [1,*], Azli Muhammad [2], Tunku Nur Atikhah Tunku Abaidah [1], Mohd Farid Shamsudin [3] and Filzah Md Isa [4]

[1] School of Business Management, Universiti Utara Malaysia, Sintok 06010, Kedah, Malaysia; t.nur.atikhah@uum.edu.my
[2] Commerce Department, Politeknik Sultan Abdul Halim Mu'adzam Shah, Bandar Darulaman, Jitra 06000, Kedah, Malaysia; azli.m@polimas.edu.my
[3] International Business School, University Kuala Lumpur, Jalan Sultan Ismail, Kuala Lumpur 50250, Malaysia; mfarid@unikl.edu.my
[4] School of Management and Marketing, Taylor's University, Subang Jaya 47500, Selangor, Malaysia; filzah.mdisa@taylors.edu.my
* Correspondence: azila@uum.edu.my

Abstract

In response to the increasing global emphasis on sustainability, electric vehicles (EVs) have emerged as promising alternative vehicles. Grounded in the Value–Attitude–Behaviour (VAB) model and the Theory of Planned Behaviour (TPB), this study investigates Malaysian consumers' intention to choose EVs as their preferred mode of transportation. Specifically, the study explores the relationships between price, maintenance cost, infrastructure readiness, consumer attitudes, and purchase intention. Moreover, it examines the mediating role of consumer attitude in the relationships between price, maintenance cost, and infrastructure readiness with the intention to purchase EVs. A total of 252 respondents from Malaysia participated in the study, with data collected using a proportionate stratified sampling technique. Out of the seven hypotheses tested, six were supported. The findings reveal that maintenance cost, infrastructure readiness, and attitude have significant positive relationships with consumers' intention to purchase EVs. The results further indicate that consumer attitude mediates the relationship between price, maintenance cost, and infrastructure readiness with the intention to purchase EVs. Theoretically, this study contributes to the existing body of knowledge by developing a framework that integrates value-based antecedents with attitudinal and behavioural outcomes. Practically, the findings provide valuable insights for marketers and policymakers to formulate effective strategies and policies that can accelerate EV adoption.

Keywords: electric vehicles (EVs); intention to purchase; Value–Attitude–Behaviour (VAB) model; Theory of Planned Behaviour (TPB); attitude

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Academic Editor: Mohammed Chadli

Received: 14 October 2025
Revised: 16 November 2025
Accepted: 19 November 2025
Published: 23 November 2025

Citation: Mohd Noor, N.A.; Muhammad, A.; Tunku Abaidah, T.N.A.; Shamsudin, M.F.; Md Isa, F. Price, Maintenance Cost, Infrastructure Readiness, and Attitude: An Integrated Model of Electric Vehicle (EV) Purchase Intention. *Vehicles* **2025**, *7*, 136. https://doi.org/10.3390/vehicles7040136

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1. Introduction

The global transportation sector faces immense pressure to mitigate its substantial contribution to greenhouse gas emissions, with road transport being a primary culprit (Lashari et al., 2021 [1]). This imperative has catalyzed a worldwide shift towards sustainable mobility solutions, prominently featuring electric vehicles (EVs) as a key technological pathway to decarbonisation and improved urban air quality (Degirmenci & Breitner, 2017 [2]). However, despite the widely acknowledged environmental benefits, the widespread adoption

of EVs remains constrained by a complex interplay of consumer perceptions and market realities (Rafiq et al., 2023 [3]). A notable challenge arises from consumers' mixed emotions regarding EV purchases, often stemming from scepticism about reliability and a lack of essential support infrastructure (Rafiq et al., 2023 [3]). Consequently, understanding the factors influencing consumer purchase intention for EVs is crucial for policymakers and manufacturers aiming to accelerate this transition (Wang et al., 2022 [4]).

This understanding necessitates a comprehensive examination of various antecedents, encompassing not only EV characteristics and associated policies but also consumer characteristics (Ivanova & Moreira, 2023 [5]). This study therefore investigates the integrated effects of price, maintenance cost, infrastructure readiness, and consumer attitude on the intention to purchase EVs, providing a holistic perspective on EV adoption drivers (Ramachandaran et al., 2023 [6]).

Studies such as Chang and Liu (2022 [7]) deal with the problem of controlling an active front steering (AFS) system in an EV, and Chang et al. (2024 [8]) address subsystem control for EVs. While these works primarily focus on engineering performance of EVs, the present study adopts a higher-level perspective by examining consumer behaviour and market/system integration factors that influence EV adoption. By shifting the focus from technical control to behavioural and economic determinants, this study provides complementary insights into the adoption process, addressing aspects of EV uptake that are not captured in purely engineering-oriented research.

Many governments worldwide have introduced incentives such as tax rebates, subsidies, and investment in charging infrastructure to encourage consumers to switch from conventional internal combustion engine vehicles to EVs (Ahmad et al., 2024 [9]; Wang et al., 2022 [10]). Despite these efforts, the pace of EV adoption has been slower than anticipated, particularly in developing countries, where financial, infrastructural, and behavioural barriers remain significant.

Previous studies have identified several critical determinants influencing consumers' willingness to purchase EVs (Haustein et al., 2018 [11]; Kim et al., 2019 [12]; Taamneh et al., 2025 [13]). Among the most prominent are the high purchase price relative to traditional vehicles (Adepetu & Keshav, 2017 [14]; Tissayakorn, 2025 [15]), perceived uncertainty in maintenance costs especially regarding battery replacement and long-term servicing and the readiness of charging infrastructure, (Xia et al., 2022 [16]; Muzir et al., 2022 [17]) which remains uneven and often inadequate. These economic and infrastructural barriers directly influence consumer decision-making and have been widely cited as obstacles to mainstream adoption.

Consumer behaviour is not shaped by objective factors alone; psychological and attitudinal dimensions play a decisive role in translating these external barriers into behavioural intention (Ajzen et al., 2018 [18]; Chawla & Joshi, 2019 [19]). Attitude, as a central construct in consumer behaviour theories, plays a pivotal role in shaping purchase intention, yet its mediating role in the context of EV adoption remains underexplored (Emon & Khan, 2025 [20]; Carrión-Bósquez et al., 2025 [21]). This gap limits a comprehensive understanding of how economic and infrastructural barriers translate into consumer intentions through attitudinal shifts. Consequently, without addressing this mediating pathway, policymakers and industry stakeholders may not fully capture the behavioural dynamics driving EV adoption.

Attitude, as emphasized in the Theory of Planned Behaviour (TPB), is a pivotal construct that mediates how consumers perceive and evaluate external factors before forming purchase intentions (Ajzen & Cote, 2008 [22]; Tiwari et al., 2024 [23]). Despite this, limited research has explored the mediating role of attitude in the relationship between economic and infrastructural determinants and EV purchase intention. Most existing

studies examine these determinants in isolation or treat attitude merely as a direct predictor, overlooking its potential function as a psychological bridge between external conditions and behavioural outcomes (Buhmann et al., 2024 [24]; García de Blanes Sebastián et al., 2024 [25]; Salon et al., 2025 [26]).

Furthermore, much of the empirical evidence originates from developed countries, where supportive policies and mature infrastructure reduce adoption barriers (Bösehans et al., 2023 [27]; Singh et al., 2023 [28]). In contrast, emerging markets face different challenges, including higher price sensitivity, limited charging facilities, and lower consumer awareness (Hakam & Jumayla, 2024 [29]; Jaiswal et al., 2022 [30]). These contextual differences highlight the need to examine how economic, infrastructural, and attitudinal factors interact in shaping purchase intention, particularly in contexts where adoption is still in its early stages.

In summary, while previous research has recognized the impact of factors such as price, maintenance cost, and infrastructure readiness on EV adoption, little emphasis has been placed on the mediating influence of consumer attitude in these relationships. This oversight limits a full understanding of how economic and infrastructural conditions translate into behavioural intentions through psychological processes. Therefore, this study seeks to examine the effects of price, maintenance cost, and infrastructure readiness on consumers' intention to purchase EVs, with a particular focus on the mediating role of attitude. By proposing and validating an integrated model, the study contributes to both theoretical advancements in consumer adoption behaviour and practical guidance for policymakers, manufacturers, and other stakeholders aiming to promote sustainable transportation.

The following sections of this article are organized in the subsequent manner: Section 2 presents the literature review, outlines the development of hypotheses, and introduces the research framework. Section 3 details the methodological approach. Section 4 delves into the data analysis. Section 5 provides a discussion of the findings. Section 6 explores both theoretical and practical implications, acknowledges the study's limitations, and suggests directions for future research. Finally, the concluding remarks are presented in the last section.

2. Background Literature and Proposed Hypotheses

2.1. Underpinning Theories

Comprehending consumers' intentions to purchase EVs necessitates a theoretical perspective that connects external economic and infrastructural influences with internal psychological mechanisms. Two well-established behavioural models namely the Value–Attitude–Behaviour (VAB) framework proposed by Homer and Kahle (1988 [31]) and the Theory of Planned Behaviour (TPB) introduced by Ajzen (1991 [32]) provide a robust foundation for explaining this relationship.

The VAB model suggests that individuals' underlying values shape their attitudes, which in turn influence their behaviours. It highlights that values serve as the foundation for evaluating objects or actions, and these evaluations are manifested as attitudes that determine behavioural intentions (Cheung & To, 2019 [33]). Chaturvedi et al. (2023 [34]) addressed that in the context of EV adoption, consumers form assessments based on the perceived values derived from tangible and functional characteristics of EVs. Specifically, price and maintenance cost reflect economic value, indicating affordability and cost efficiency, while infrastructure readiness represents functional value, signifying convenience and ease of use (Wang et al., 2022 [10]). When consumers perceive strong economic and functional value, they tend to develop more favourable attitudes toward EVs. Thus, attitude functions as a mediating mechanism that converts perceived values into behavioural intentions. The VAB model, therefore, provides a theoretical rationale for understanding

how external economic and infrastructural factors shape consumers' purchase intentions through internal evaluative judgments.

Complementing this, the TPB provides additional insight into the psychological determinants of behavioural intention. According to TPB, intention to perform a behaviour is influenced by attitude toward the behaviour, subjective norms, and perceived behavioural control (Shalender & Sharma, 2022 [35]). Among these, attitude is the most direct predictor of behavioural intention. The present study extends beyond the original TPB framework, which traditionally comprises attitude, subjective norms, and perceived behavioural control as predictors of behavioural intention. In this study, TPB is adopted as the core theoretical foundation to explain the psychological mechanism underlying EV purchase intention. However, to better capture the context-specific determinants of EV adoption, we incorporated price, maintenance cost, and infrastructure readiness as external variables that influence intention to purchase EVs. This approach is consistent with prior TPB extensions (e.g., Haustein & Jensen, 2018 [11]; Wang et al., 2016 [36]), where additional variables are introduced to enhance explanatory power and contextual relevance. In addition, in our conceptualization, attitude functions as a mediator linking these external, situation-specific factors to purchase intention, which remains the core outcome variable in line with TPB. Thus, the model maintains TPB's central structure (attitude $\rightarrow$ intention) while broadening its scope to include key economic and infrastructural determinants relevant to EV adoption. This integration allows the model to reflect both psychological evaluations (as proposed by TPB) and contextual influences (specific to EV purchasing behaviour).

In the present study, the TPB framework reinforces the mediating role of attitude, suggesting that favourable evaluations of EVs shaped by perceptions of affordability, low maintenance, and accessible charging infrastructure enhance consumers' intention to purchase. Furthermore, infrastructure readiness can also strengthen perceived behavioural control, as consumers are more confident in their ability to use EVs when adequate charging facilities are available.

By integrating the VAB model and TPB, this study proposes a comprehensive framework that links external value-based factors (price, maintenance cost, and infrastructure readiness) with internal psychological constructs (attitude and purchase intention). This integration enables a more holistic understanding of how economic and infrastructural considerations are transformed into behavioural intention through the mediating influence of attitude.

This study contributes to the theoretical insights on EV adoption by combining the VAB model (Homer & Kahle, 1988 [31]) with the TPB (Ajzen, 1991 [32]) into a unified analytical framework. While prior studies have examined the influence of price, maintenance cost, or infrastructure readiness individually (Degirmenci & Breitner, 2017 [2]; Liu et al., 2021 [37]) limited attention has been given to how these external factors shape behavioural intention through attitude. Through empirical examination of attitude as a mediating factor, this study enhances the explanatory power of both the VAB model and the TPB. It reveals that value perceptions shaped by economic and infrastructural considerations serve as critical precursors to favourable attitudes, which in turn significantly influence the intention to purchase.

2.2. The Influence of Price, Maintenance Cost and Infrastructure Readiness on Consumers' Intentions to Purchase EVs

A substantial body of research has studied the determinants influencing consumers' intention to purchase EVs, with price emerging as a critical factor. Prior studies consistently indicate that the relatively high upfront purchase cost of EVs, when compared with conventional fuel vehicles (CFVs) of equivalent specifications, represents a primary obstacle to adoption (Adepetu & Keshav, 2017 [14]; Barth et al., 2016 [38]). Barth et al. (2016 [38])

further suggested that consumers with limited knowledge about EV technology tend to base their evaluations predominantly on tangible purchase costs and payback periods, which may lead to less favourable assessments of EVs relative to CFVs. Similarly, Adepetu and Keshav (2017 [14]) emphasized that comparative information on ownership costs, usage, and price between CFVs and EVs significantly shapes consumers' attitudes and behavioural intentions. Consistent with these findings, Ivanova and Moreira (2023 [5]) and Dutta and Hwang (2021 [39]) reaffirmed that vehicle price remains a dominant determinant in the decision-making process for EV adoption. Overall, empirical findings consistently affirm that pricing plays a pivotal role in shaping consumers' intentions to adopt EVs. In light of the preceding discussion, the study proposes the following hypothesis:

H1: *Price has a significant effect on consumers' intention to purchase EVs.*

Maintenance costs have likewise emerged as a significant economic determinant affecting consumers' willingness to adopt EVs. Compared to CFVs, EVs generally require lower maintenance due to fewer moving parts and the absence of components such as exhaust systems or oil filters (Liu et al., 2021 [37]; Kim & Kang, 2022 [40]). Several studies have demonstrated that the perception of reduced maintenance expenses enhances consumers' evaluation of EVs' long-term affordability and value for money, thereby strengthening purchase intention (Liu et al., 2021 [37]; Krishnan & Koshy, 2021 [41]). In a similar vein, Adnan et al. (2017 [42]) examined Malaysian consumers' behavioural modelling toward plug-in hybrid and electric vehicle (PHEV/EV) adoption, incorporating maintenance cost as among the key factors influencing purchase intention. Conversely, when consumers perceive high or uncertain maintenance costs, their likelihood of adopting EVs decreases (Suttakul et al., 2022 [43]). Barth et al. (2016 [38]) and Adepetu and Keshav (2016 [14]) further noted that limited consumer awareness regarding the actual maintenance savings of EVs may undermine their willingness to purchase. The body of existing research highlights that consumers' perceptions of maintenance costs significantly influence their economic assessments and subsequent intentions to adopt EVs. Based on this understanding, the following hypothesis is proposed:

H2: *Maintenance cost has a significant effect on consumers' intention to purchase EVs.*

EVs rely heavily on supporting infrastructure for effective operation. However, infrastructure-related challenges persist, primarily due to the limited availability of charging stations and the difficulties associated with adapting existing facilities to accommodate EV requirements (Hopkins et al., 2023 [44]). The availability and accessibility of charging infrastructure directly affect consumers' confidence in the practicality and convenience of EV ownership (Pamidimukkala et al., 2023 [45]; Wang et al., 2022 [10]). Inadequate public charging stations and limited home-charging facilities often create "range anxiety," which serves as a psychological barrier to EV adoption (Wang et al., 2022 [4]). Several empirical studies have confirmed that well-developed charging infrastructure mitigates perceived inconvenience and enhances the attractiveness of EVs (Ledna et al., 2022 [46]; Wang et al., 2022 [10]). Moreover, Barth et al. (2016 [38]) highlighted that government and private sector investment in charging networks positively influences consumers' attitudes and behavioural intentions. Hence, infrastructure readiness is widely recognized as a decisive enabler in promoting consumers' intention to purchase EVs, as it directly addresses concerns related to accessibility, convenience, and vehicle usability. Extensive research has demonstrated that inadequate infrastructure significantly influences consumers' intentions to purchase EVs (Dutta & Hwang, 2021 [39]; Pamidimukkala et al., 2023 [45]). This issue not only hampers market performance but has also emerged as a primary barrier to the

widespread adoption of EVs (Burra et al., 2024 [47]). Studies suggest that expanding public charging infrastructure positively correlates with increased EV sales. Nonetheless, during the initial phases of market development, private charging solutions such as residential and workplace installations have also played a crucial role (Faustino et al., 2023 [48]; Hopkins et al., 2023 [44]; Potoglou et al., 2023 [49]). Furthermore, reduced overall costs related to home charging unit installation and vehicle operation are shown to significantly improve consumer attitudes and behavioural intentions toward EV adoption (Li & Jenn, 2022 [50]).

Additionally, Low et al. (2023 [51]) emphasized that alternative fuel vehicles can effectively compete with conventional vehicles when adequate refuelling infrastructure is in place. This underscores the critical role of infrastructure readiness in shaping consumer attitudes and fostering public acceptance of EVs. Accordingly, this study proposes that infrastructure readiness is a key factor influencing EV adoption.

H3: *Infrastructure readiness has a significant effect on consumers' intention to purchase EVs.*

Attitude reflects the degree to which a consumer positively or negatively assesses a specific behaviour (Sahoo et al., 2022 [52]). Within the context of EV adoption, attitude refers to the extent to which an individual evaluates the decision to purchase or use EVs favourably or unfavourably in terms of their attributes, benefits, and usability (Lashari et al., 2021 [1]). According to the TPB (Ajzen, 1991 [32]), a more positive consumer attitude toward a product strengthens the intention to perform the corresponding behaviour. Therefore, when consumers hold favourable attitudes toward EVs such as perceiving them as environmentally friendly, cost-effective, or technologically advanced they are more likely to develop a stronger intention to purchase and use them.

Previous research has consistently shown that consumer attitude serves as a strong predictor of the intention to purchase EVs (Mohd Noor et al., 2025 [53]; Adu-Gyamfi et al., 2022 [54]). For instance, consumers who perceive EVs as contributing to environmental sustainability or offering long-term savings tend to show a higher willingness to adopt them (Dutta & Hwang, 2021 [39]; Toukabri & Boutaleb, 2025 [55]). Similarly, Afroz et al. (2015 [56]) explored the influence of individual values and attitudes on EV purchase intention in Malaysia, highlighting the psychological dimensions of consumer decision-making. Hence, understanding and promoting positive consumer attitudes toward EVs is crucial in promoting their adoption and supporting the transition toward sustainable mobility. Thus, this study hypothesized that attitude gives significant influence on the purchase intention of EVs.

H4: *Attitude has a significant effect on consumers' intention to purchase EVs.*

2.3. Mediating Effect of Consumers' Attitudes on the Relationship Between Price, Maintenance Cost, Infrastructure Readiness and Intentions to Purchase EVs

Attitude plays a crucial mediating role in the relationship between consumers' value perceptions and their intention to purchase EVs (Ali & Naushad, 2022 [57]; Hu et al., 2025 [58]). According to the VAB model, individuals' values and evaluations of product attributes influence their attitudes, which in turn shape behavioural intentions (Wang et al., 2022 [10]). In the context of EV adoption, perceived economic value (reflected through price and maintenance cost) and functional value (represented by infrastructure readiness) form the evaluative basis upon which attitudes are developed. When consumers perceive EVs as cost-effective, affordable to maintain, and supported by adequate charging infrastructure, they are more likely to develop favourable attitudes toward EV ownership (Gautam & Bolia, 2024 [59]; Farinloye et al., 2024 [60]). Conversely, perceptions of high cost, uncertain maintenance savings, or insufficient infrastructure can foster negative attitudes

that diminish purchase intention. Empirical evidence has shown that attitude serves as a critical psychological mechanism that translates these perceived values into behavioural intentions (Qian & Li, 2024 [61]; Sepe et al., 2025 [62]). Accordingly, this study puts forward the following hypotheses:

H5: *Consumers' attitudes mediate the relationship between price, maintenance cost and infrastructure readiness and intentions to purchase EVs.*

H5a: *Consumers' attitudes mediate the relationship between price and intentions to purchase EVs.*

H5b: *Consumers' attitudes mediate the relationship between maintenance cost and intentions to purchase EVs.*

H5c: *Consumers' attitudes mediate the relationship between infrastructure readiness and intentions to purchase EVs.*

2.4. Formulation of the Theoretical Framework

To construct the theoretical model for this study, a comprehensive review of established theoretical frameworks and prior empirical research was undertaken. The model posits that price perception, maintenance cost, and infrastructure readiness exert a direct influence on consumers' intention to purchase EVs. Furthermore, consumer attitude is anticipated to not only directly affect purchase intention but also serve as a mediating factor in the relationships between the aforementioned variables and EV adoption. The proposed conceptual framework is depicted in Figure 1 below.

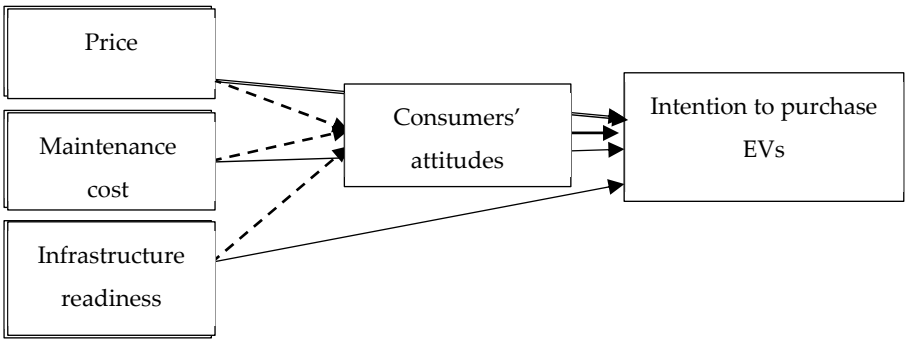


Figure 1. Conceptual framework.

3. Methodology and Data Collection Procedure

This study employed a quantitative methodology utilizing a cross-sectional design. Data collection was conducted through a structured questionnaire, targeting respondents in the Klang Valley region of Malaysia to investigate their intentions to purchase EVs. The Klang Valley was chosen as the study location because of its well-developed transportation network and extensive availability of EV charging facilities, making it an ideal area for exploring EV adoption behaviour (An et al., 2024 [63]; Umair et al., 2024 [64]). The study targeted respondents aged 25 years and above, as this demographic represents potential buyers of high-end products and generally possesses greater disposable income as well as a stronger need for private transportation. Prior studies have indicated that younger consumers, especially those below 45 years of age, are more likely to adopt EVs (Esteves et al., 2021 [65]; Ji & Gan, 2022 [66]). This inclination is often linked to their openness to technological innovation, positive attitudes toward change, and heightened environmental consciousness. Moreover, younger consumers tend to place considerable importance on

attributes such as vehicle performance, value, quality, and perceived risk when making purchasing decisions (De Luca et al., 2024 [67]; Lashari & Jang, 2021 [1]).

This study adopted a proportionate stratified sampling technique, whereby the target population was segmented into distinct strata according to major urban centres within the Klang Valley region specifically Kuala Lumpur, Ampang, Klang, Shah Alam, Subang Jaya, and Petaling Jaya. Based on Cohen's Rules of Thumb, a minimum sample size of 228 is deemed appropriate for partial least squares structural equation modelling (PLS-SEM) involving four paths directed toward a single construct (Hair et al., 2017 [68]). To gather the required data, the study employed an intercept survey technique. Trained interviewers followed a systematic sampling approach by inviting every tenth individual entering selected EV showrooms across key cities in the Klang Valley region to participate in the survey. This sampling approach facilitated a consistent and impartial selection process, effectively reducing interviewer bias and improving the overall representativeness of the dataset (Ahmed, 2024 [69]; Rahman et al., 2022 [70]). The intercept survey method was considered suitable for this study, as it allowed direct engagement with prospective buyers at the moment of purchase consideration, thereby yielding more precise and contextually relevant insights into their attitudes and intentions regarding EV adoption.

Upon securing informed consent, participants were administered a structured questionnaire. Over the course of four months, a total of 300 questionnaires were distributed. Respondents were asked to complete the survey and submit it immediately after completion to ensure timely and accurate data collection. Out of the 283 questionnaires successfully collected, only 270 were deemed valid and suitable for subsequent analysis. Eighteen questionnaires were excluded due to incomplete or inconsistent responses that could compromise data quality. After data screening, the final sample of 252 usable responses represented an effective response rate of 84 percent, which is considered highly acceptable for survey-based research in the social sciences (Holtom et al., 2022 [71]). The high response rate also reflects the respondents' willingness to participate and the appropriateness of the data collection approach employed in this study.

The questionnaire was designed based on previously validated measurement items adapted from past studies to ensure reliability and construct validity. All constructs were measured using a five-point Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree"). The constructs included price, maintenance cost, infrastructure readiness, attitude, and purchase intention toward EVs. The items for each construct were adapted from established sources and refined to suit the EV adoption context.

To measure consumers' intention to purchase EVs, five items were adapted from Loudiyi et al. (2022 [72]) and Ackaah et al. (2022 [73]). Consumer attitudes toward EVs were assessed using four items derived from Dutta and Hwang (2021 [39]). Infrastructure readiness was evaluated through five items adapted from Sang and Bekhet (2015 [74]). Additionally, five items were used to measure perceptions of maintenance cost and price, drawing from the studies of Dutta and Hwang (2021 [39]) and Ali and Naushad (2022 [57]). A preliminary test of the questionnaire was carried out involving two academicians from Malaysian universities and two from international institutions. The objective of this pre-test was to assess the clarity, relevance, and suitability of the questionnaire items, thereby ensuring face validity. Feedback from these experts was carefully reviewed, resulting in minor revisions to the wording, structure, and sequencing of several items to improve readability and ensure that the questions were easily understood by respondents.

Subsequent to the pre-test, a pilot study was conducted involving 30 participants from a city in northern Malaysia to evaluate the reliability and internal consistency of the measurement items. The analysis yielded Cronbach's alpha values ranging from 0.752 to

0.931, surpassing the commonly accepted threshold of 0.70, thereby indicating satisfactory internal consistency (Pallant, 2020 [75]).

For the purpose of data analysis, the collected responses were coded and processed using the Statistical Package for the Social Sciences (SPSS) version 31 to perform descriptive statistical analysis and preliminary data screening. Subsequently, Partial Least Squares Structural Equation Modelling (PLS-SEM) was applied using SmartPLS software version 4 to evaluate the hypothesized relationships among the study variables. The PLS-SEM technique was selected for its appropriateness in exploratory research contexts and its robustness in analyzing complex models involving multiple constructs and mediating effects (Hair et al., 2017 [68]).

4. Results

4.1. Respondents' Profile

Table 1 presents the demographic characteristics of the 252 valid survey respondents. Among them, 148 were male (59%) and 104 were female (41%). The study focused on individuals aged 25 years and above, with the highest representation from the 41–50 age group (43%), followed by those aged 31–40 (28%), 25–30 (20%), and 51 and above (9%). A majority of participants were married (72%). Regarding educational background, 39 percent of respondents held a bachelor's degree (n = 89), 24 percent a master's degree (n = 60), and 21 percent a diploma (n = 52). Additionally, 11 percent had completed secondary education (n = 28), 4 percent held a Ph.D. (n = 11), and 1 percent possessed professional qualifications (n = 3). Regarding employment sector, majority of the respondents worked in the private sector (65%), followed by the government sector (11%). The remaining respondents comprised self-employed individuals (13%), and others (5%). These results indicate that the sample primarily consisted of mature, well-educated, and professionally active individuals, which aligns with the characteristics of potential adopters of electric vehicles in Malaysia.

Table 1. Demographic Profile of Respondents (n = 252).

Variable	Category	Frequency	Percentage
Gender	Male	148	59
	Female	104	41
Age Category	25–30 years	51	20
	31–40 years	70	28
	41–50 years	108	43
	51 and above	23	9
Educational Attainment	Secondary Level	28	11
	Diploma	52	21
	Bachelor's Degree	98	39
	Master's Degree	60	24
	Ph.D.	11	4
	Others	3	1
Marital Status	Single	64	25
	Married	181	72
	Divorced/Widowed	7	3
Employment Sector	Government	44	17
	Private	165	65
	Self-Employed	32	13
	Others	11	5

4.2. Measurement Model

The initial phase of data analysis involved evaluating the measurement model to ensure the reliability and validity of the constructs. This assessment was carried out using the PLS Algorithm, which examined key indicators including factor loadings, composite reliability (CR), Cronbach's alpha (α), and average variance extracted (AVE). As recommended by Hair et al. (2019 [76]), factor loadings exceeding 0.70 are indicative of acceptable item reliability. In the present study, all factor loadings met this threshold, confirming the reliability of individual items. Subsequently, convergent validity was assessed. The results showed that both CR and Cronbach's alpha values exceeded 0.70, while AVE values were above 0.50, as recommended by Hair et al. (2011 [77]). These results confirm that the measurement instruments demonstrated satisfactory reliability and validity. The outcomes of the convergent validity assessment are presented in Table 2 and Figure 2 below.

Table 2. Convergent Validity and Reliability of the Construct.

Constructs	Indicators	Loadings	Cronbach's Alpha	Composite Reliability	Average Variance Extracted
Consumers' Attitudes (ATT)	ATT1	0.808	0.876	0.915	0.731
	ATT2	0.812			
	ATT3	0.898			
	ATT4	0.896			
Infrastructure Readiness (INFRA)	INFRA1	0.887	0.925	0.943	0.769
	INFRA2	0.901			
	INFRA3	0.837			
	INFRA4	0.875			
	INFRA5	0.883			
Purchase Intention (INT)	INT1	0.873	0.917	0.938	0.752
	INT2	0.880			
	INT3	0.901			
	INT4	0.837			
	INT5	0.842			
Maintenance Cost (MAINT)	MAINT1	0.928	0.955	0.965	0.848
	MAINT2	0.895			
	MAINT3	0.929			
	MAINT4	0.913			
	MAINT5	0.939			
Price (PRICE)	PRICE1	0.860	0.905	0.930	0.726
	PRICE2	0.863			
	PRICE3	0.887			
	PRICE4	0.787			
	PRICE5	0.858			

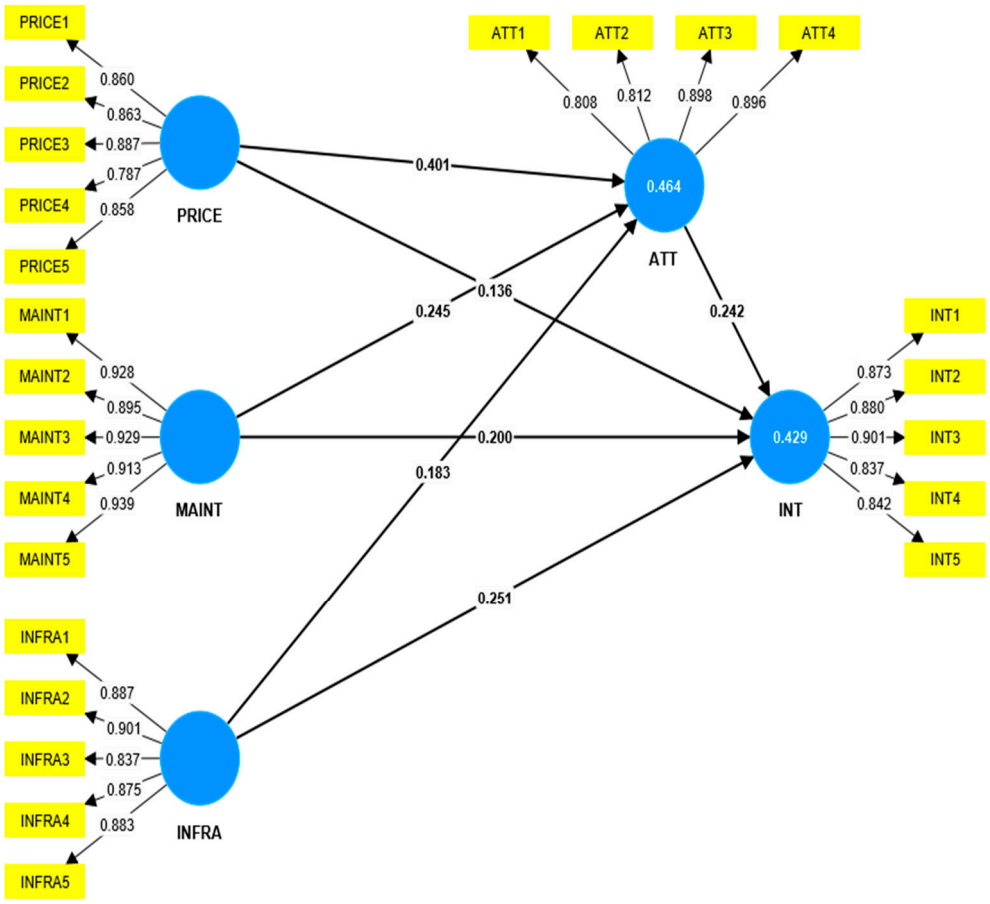


Figure 2. Measurement Model Assessment.

Next, the study assessed discriminant validity, which determines whether constructs that are theoretically distinct are also empirically different. To evaluate this, the study employed the Heterotrait–Monotrait (HTMT) ratio of correlations, a robust method widely recommended by scholars for assessing discriminant validity. According to Henseler et al. (2015 [78]), HTMT values below 0.85 indicate that discriminant validity has been established. In this study, all HTMT values were found to be below the 0.85 threshold, confirming that the constructs are empirically distinct and that no issues of discriminant validity were present. The results of the HTMT assessment are presented in Table 3.

Table 3. Discriminant Validity.

Constructs	ATT	INFRA	INT	MAINT	PRICE
ATT					
INFRA	0.480				
INT	0.611	0.531			
MAINT	0.619	0.475	0.564		
PRICE	0.686	0.384	0.536	0.642	

To further evaluate discriminant validity, the study employed the Fornell and Larcker (F&L) criterion. This approach ensures that each latent construct is conceptually and empirically distinct, measuring only its intended dimension. As per Fornell and Larcker (1981 [79]), discriminant validity is confirmed when the square root of the Average Variance Extracted (AVE) for a given construct is greater than its correlations with any other construct. As presented in Table 4, all constructs satisfied this condition, thereby affirming the adequacy of discriminant validity and indicating no concerns within the dataset.

Table 4. Fornell and Larcker Criterion.

Constructs	ATT	INFRA	INT	MAINT	PRICE
ATT	0.855				
INFRA	0.434	0.877			
INT	0.547	0.493	0.867		
MAINT	0.567	0.447	0.531	0.921	
PRICE	0.612	0.352	0.492	0.598	0.852

Finally, this study also examined cross-loadings as part of the discriminant validity assessment. In this approach, each indicator is expected to have a higher loading on its associated latent construct than on any other construct, thereby confirming the distinctiveness of each construct. As presented in Table 5, all indicators demonstrated higher loadings on their respective constructs compared to others, indicating that the cross-loading criteria were satisfactorily met. Consequently, no issues related to discriminant validity were detected in the data.

Table 5. Cross-Loadings.

Items	ATT	INFRA	INT	MAINT	PRICE
ATT1	0.808	0.406	0.448	0.453	0.495
ATT2	0.812	0.315	0.443	0.478	0.531
ATT3	0.898	0.369	0.486	0.511	0.547
ATT4	0.896	0.394	0.490	0.496	0.520
INFRA1	0.403	0.887	0.445	0.360	0.281
INFRA2	0.417	0.901	0.453	0.437	0.350
INFRA3	0.307	0.837	0.397	0.404	0.272
INFRA4	0.391	0.875	0.487	0.366	0.337
INFRA5	0.374	0.883	0.365	0.399	0.298
INT1	0.461	0.424	0.873	0.489	0.389
INT2	0.488	0.395	0.880	0.452	0.437
INT3	0.480	0.481	0.901	0.471	0.440
INT4	0.465	0.423	0.837	0.427	0.487
INT5	0.477	0.411	0.842	0.460	0.377
MAINT1	0.534	0.414	0.487	0.928	0.557
MAINT2	0.530	0.429	0.559	0.895	0.557
MAINT3	0.531	0.406	0.438	0.929	0.532
MAINT4	0.513	0.448	0.516	0.913	0.565
MAINT5	0.498	0.353	0.428	0.939	0.540
PRICE1	0.537	0.319	0.417	0.508	0.860
PRICE2	0.560	0.259	0.426	0.513	0.863
PRICE3	0.550	0.310	0.471	0.525	0.887
PRICE4	0.468	0.273	0.327	0.467	0.787
PRICE5	0.484	0.341	0.439	0.534	0.858

In addition, the study assessed the potential presence of multicollinearity among the independent variables. Multicollinearity arises when predictors exhibit high intercorrelations, which can undermine the stability and interpretability of the model estimates. To evaluate this, the Variance Inflation Factor (VIF) was utilized as a diagnostic measure. As per the guideline by Hair et al. (2011 [77]), VIF values above 5 may signal multicollinearity concerns, while values below this threshold indicate acceptable levels. As presented in Table 6, all VIF values were found to be below 5, indicating that multicollinearity did not pose a problem in the dataset.

Table 6. Multicollinearity Assessment.

Construct	ATT	INT
ATT		1.866
INFRA	1.268	1.330
MAINT	1.730	1.842
PRICE	1.580	1.879

4.3. Structural Model

Following the comprehensive evaluation of the measurement model, the study advanced to the structural model assessment to investigate the hypothesized relationships among the constructs. This analysis employed PLS bootstrapping with 5000 subsamples to estimate path coefficients and test significance levels. In accordance with Hair et al. (2011 [77]), a path is deemed statistically significant when the t-value exceeds 1.96 and the *p*-value falls below 0.05. The outcomes of this assessment are detailed in Table 7 and visually represented in Figure 3.

Table 7. Direct Path Findings.

Hypothesis	Direct Paths	Original Sample	Standard Deviation	T Statistics	*p* Values
H1	PRICE -> INT	0.136	0.080	1.695	0.090
H2	MAINT -> INT	0.200	0.072	2.775	0.006
H3	INFRA -> INT	0.251	0.059	4.239	0.000
H4	ATT -> INT	0.242	0.072	3.347	0.001

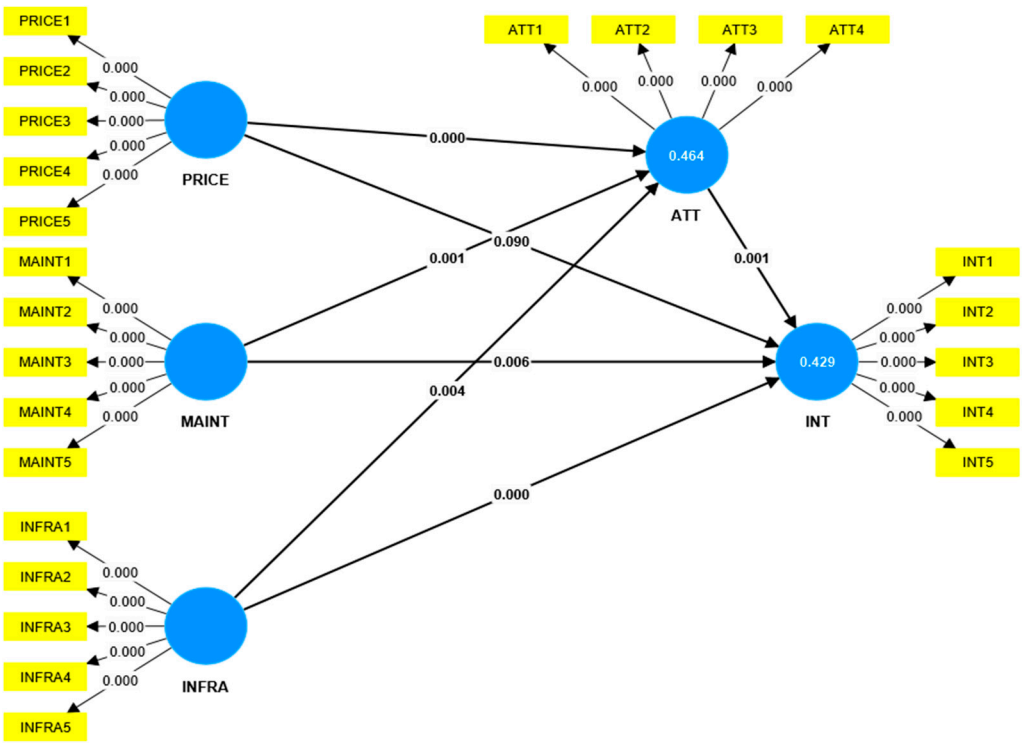


Figure 3. Structural Model Assessment.

According to the results for H1, there was no significant relationship between price and consumers' intention to purchase EVs (t = 1.695, p = 0.090). For H2, the findings revealed a significant relationship between maintenance cost and consumers' purchase intention toward EVs (t = 2.775, p = 0.006). Similarly, the results for H3 indicated a significant

relationship between infrastructure readiness and consumers' intention to purchase EVs (t = 4.239, $p < 0.001$). The findings for H4 also confirmed a significant relationship between consumers' attitude and their intention to purchase EVs (t = 3.347, $p = 0.001$).

Furthermore, the mediating effects were examined and summarized in Table 8. H5a was found to be significant, indicating that consumers' attitude mediates the relationship between price and purchase intention (t = 2.649, $p = 0.008$). Likewise, H5b was supported, suggesting that consumers' attitude significantly mediates the relationship between maintenance cost and purchase intention (t = 2.270, $p = 0.023$). Similarly, H5c confirmed that consumers' attitude mediates the relationship between infrastructure readiness and purchase intention (t = 2.011, $p = 0.044$).

Table 8. Indirect Path Findings.

Hypothesis	Mediating Paths	Original Sample	Standard Deviation	T Statistics	*p* Values
H5a	PRICE -> ATT -> INT	0.097	0.037	2.649	0.008
H5b	MAINT -> ATT -> INT	0.059	0.026	2.270	0.023
H5c	INFRA -> ATT -> INT	0.044	0.022	2.011	0.044

Following the structural model assessment, the coefficient of determination (R^2) was examined to evaluate the explanatory power of the independent variables on the dependent constructs. R^2 represents the proportion of variance in the dependent variable accounted for by the predictors in the model. According to Hair et al. (2007 [80]), R^2 values of 0.67, 0.33, and 0.19 are interpreted as substantial, moderate, and weak, respectively. In this study, the R^2 values indicated a moderate level of explanatory power, with consumers' attitudes toward EVs at 0.464 and behavioural intention to adopt EVs at 0.429. These results are presented in Table 9.

Table 9. Coefficient of Determination.

Variables	R-Square	R-Square Adjusted
ATT	0.464	0.458
INT	0.429	0.420

Moreover, this study examined the effect size (f^2) of the independent variables on the dependent variables to assess the strength of their relationships. The effect size is a statistical indicator that reflects the magnitude of an observed relationship. According to Cohen (1988 [81]), an f^2 value above 0.02 indicates a small effect, above 0.15 indicates a moderate effect, and above 0.35 indicates a large effect.

The results revealed that consumers' attitude toward EVs had a small effect on their intention to purchase EVs ($f^2 = 0.055$). Similarly, infrastructure readiness ($f^2 = 0.050$) and maintenance cost ($f^2 = 0.065$) showed small effects on consumers' attitude, while price demonstrated a moderate effect ($f^2 = 0.190$). In addition, infrastructure readiness ($f^2 = 0.083$) and maintenance cost ($f^2 = 0.038$) exhibited small effects on consumers' intention to purchase EVs. Conversely, the effect of price on purchase intention was less than small ($f^2 = 0.017$). The detailed findings of the effect size analysis are presented in Table 10.

Table 10. Effect Size.

Variables	ATT	INT
ATT		0.055
INFRA	0.050	0.083
MAINT	0.065	0.038
PRICE	0.190	0.017

Finally, this study investigated predictive relevance (Q^2). It was measured to investigate if the model has predictive relevance or not. This study used PLS Blindfolding method to access predictive relevance. This method is useful to establish the predictive relevance of endogenous constructs. According to Hair et al. (2011) [77], the value of predictive relevance (Q^2) above 0 confirms the model has significant predictive power. The findings reported in Figures 4 and 5 confirmed that the model of this research has significant predictive power. As shown in Table 11, the Q^2 values for attitude (ATT = 0.327) and intention to purchase EVs (INT = 0.315) are above 0, confirming that the model possesses significant predictive power for these constructs. In contrast, infrastructure readiness (INFRA), maintenance cost (MAINT), and price (PRICE) have Q^2 values of 0, indicating that while these exogenous constructs are important for explaining variation in intention, they do not themselves have predictive relevance in the Q^2 sense, which is consistent with their role as predictor variables. Overall, these results demonstrate that the proposed integrated model is robust and capable of reliably predicting consumers' intention to adopt EVs, highlighting the practical utility of incorporating both psychological (ATT) and economic (MAINT, PRICE, INFRA) factors in understanding consumer behaviour.

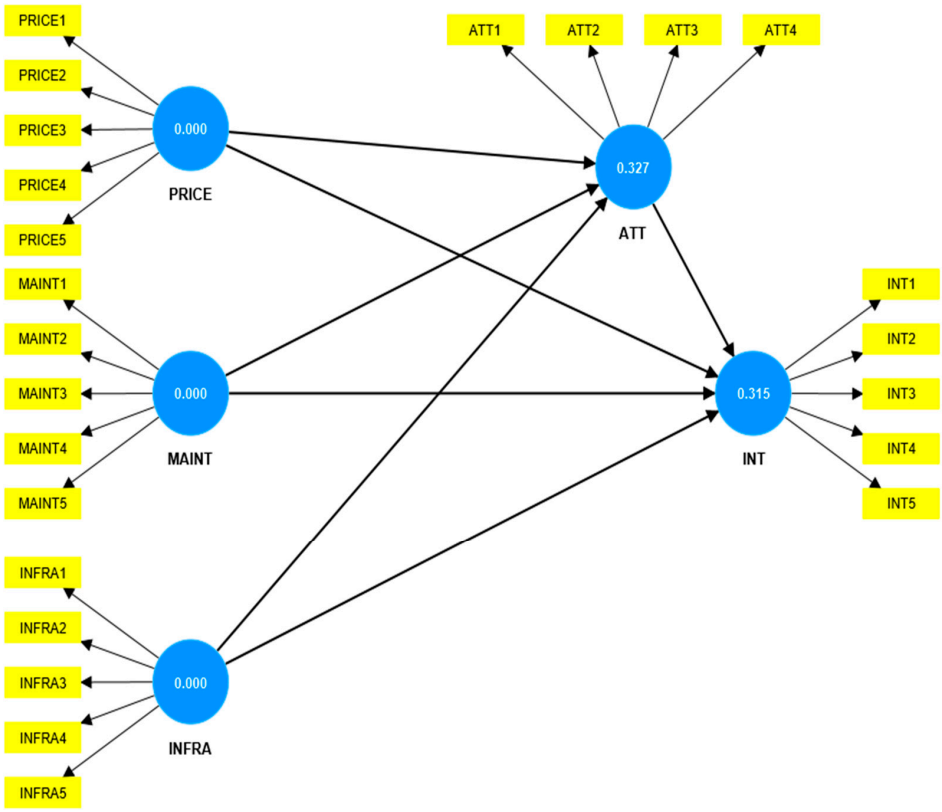


Figure 4. Predictive Relevance (Q^2) of the Model.

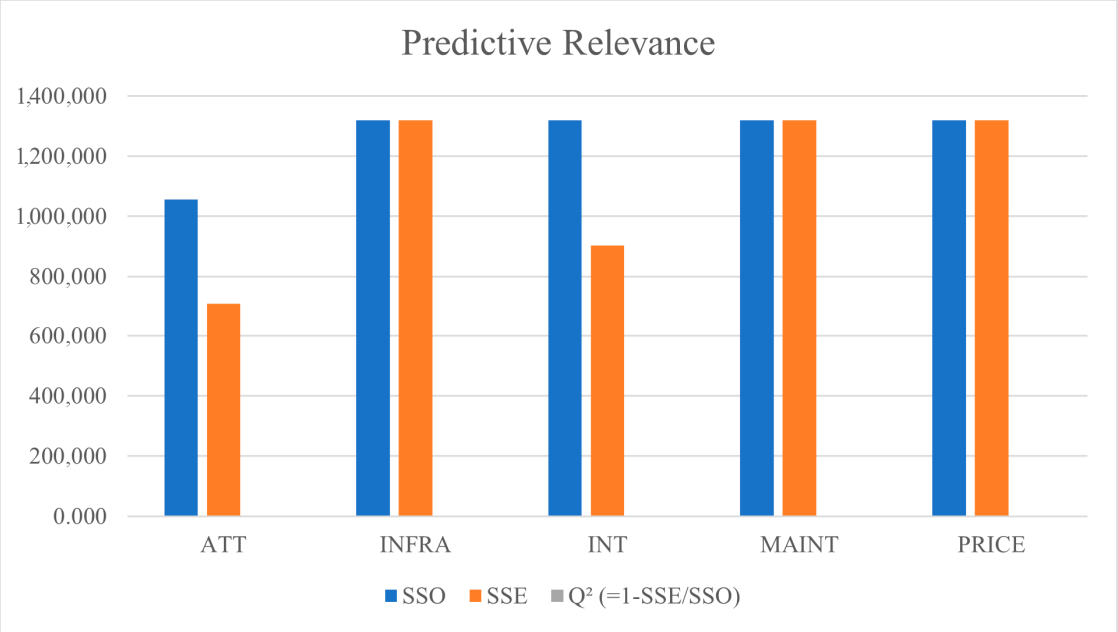


Figure 5. Predictive Relevance Chart.

Table 11. Predictive Relevance of Constructs.

Variable	SSO	SSE	Q^2 (= 1-SSE/SSO)
ATT	1,056,000	710,217	0.327
INFRA	1,320,000	1,320,000	0.000
INT	1,320,000	903,700	0.315
MAINT	1,320,000	1,320,000	0.000
PRICE	1,320,000	1,320,000	0.000

5. Discussion

Overall, this study represents an empirical attempt to investigate the underlying factors influencing consumers' intention to purchase EVs, with particular emphasis on the effects of price, maintenance cost, and infrastructure readiness, as well as the role of consumers' attitude. In addition, the study examines the mediating effect of attitude on the relationships between price, maintenance cost, and infrastructure readiness with consumers' intention to purchase EVs.

The results of this study reveal that price does not exert a direct and statistically significant influence on consumers' intention to purchase EVs. This finding contrasts with the conclusions of Thananusak et al. (2017 [82]), who identified pricing as the most influential factor affecting consumer decisions regarding green vehicles, primarily due to their generally high cost and the resulting negative purchase attitudes. However, when consumer attitude is introduced as a mediating variable, the relationship between price and purchase intention becomes statistically significant, highlighting the critical psychological role of attitude in shaping purchase behaviour. This finding underscores the pivotal psychological role of consumer attitudes in shaping how price perceptions influence the intention to purchase, suggesting that favourable attitudes can effectively translate cost considerations into actionable purchase decisions. This outcome can be explained through the VAB model, which posits that consumers' value perceptions influence their attitudes, and these attitudes subsequently determine their purchase intentions. In the context of

EV adoption, price represents an economic value that consumers assess based on their perceptions of affordability and value-for-money.

Nevertheless, price alone may not be sufficient to motivate purchase intentions, particularly for products like EVs that are often perceived as high-cost and technology-intensive. Instead, consumers are more likely to form favourable attitudes when they perceive that the higher upfront price of EVs is justified by long-term benefits such as fuel savings, lower maintenance costs, government incentives, and environmental advantages. These positive evaluations strengthen their attitudes toward EVs, which in turn enhance their intention to purchase. From the perspective of the TPB, attitude serves as a key determinant of behavioural intention. Thus, price indirectly affects purchase intention through its impact on consumers' evaluative beliefs and attitudes. This finding aligns with the notion that economic considerations must be framed within a broader attitudinal context to effectively influence purchase behaviour.

Contradicting the findings of Chenayah et al. (2024 [83]), who found that maintenance costs are significant deterrents to uptake of EVs in Malaysia, the results of this study demonstrate that maintenance cost has a significant direct relationship with consumers' intention to purchase EVs, and this relationship is also mediated by attitude. This supports a study by Ramachandaran et al. (2023 [6]) that maintenance cost perceptions significantly affect EV intention and that attitude is an important psychological path. This dual effect suggests that maintenance cost influences consumers' purchase intentions both directly through perceived economic advantages and indirectly through the development of favourable attitudes toward EVs. This is in line with Mohd Noor et al. (2025 [53]) who found that functional value (which includes cost-saving aspects) influences purchase intention of EVs through attitude. Similarly, Lashari et al. (2021 [1]) also observed that perceptions of maintenance cost had a substantial effect on intention to purchase EVs, via attitude.

From the perspective of the VAB model, maintenance cost reflects an economic value dimension that consumers consider when evaluating the practicality and long-term affordability of EV ownership. Lower maintenance costs are perceived as a key advantage of EVs compared to conventional fuel vehicles, as EVs require fewer mechanical components, less frequent servicing, and reduced dependence on consumables such as engine oil (He et al., 2025 [84]). These tangible cost savings create a positive value perception, which directly enhances consumers' willingness to purchase EVs. At the same time, favourable evaluations of maintenance cost contribute to the formation of positive attitudes toward EVs (Liu et al., 2021 [37]). When consumers perceive that EV ownership will result in lower operating and maintenance expenses, they are likely to view EVs as a cost-effective and convenient alternative to conventional vehicles. This favourable attitude, in turn, strengthens their intention to purchase. This mediating role of attitude aligns with the TPB, which posits that attitudes represent an individual's overall evaluation of a behaviour and are a central predictor of intention.

The finding that price of EV has no significant influence on consumers' intention to buy EVs, while maintenance cost play a significant influence offers valuable insight into consumer behaviour. Despite the typically high initial price of EVs, we expect that consumers in Malaysia tend to evaluate their purchase based on long-term value, prioritizing overall ownership costs over immediate expenditure. Government incentives such as reductions in import and excise duties help ease concerns about the initial price, making it less influential during the decision-making phase (Pandak et al. 2024 [85]). In contrast, maintenance costs are seen as more critical, as they represent ongoing, tangible expenses. Concerns about battery replacement, service centre availability, and repair infrastructure contribute to consumer hesitation. Although some buyers are motivated by environmental values, technological interest, or social prestige, the practical and economic aspects of maintaining

an EV remain central to their decision (Song et al., 2022 [86]; Purwanto & Irawan, 2024 [87]). This trend suggests that Malaysian consumers are increasingly pragmatic, focusing more on operational sustainability than upfront affordability when considering EV adoption. This trend might also relate to the demographic profile of the respondents in this study where most of them are above 40 years old. Individuals in this age category generally possess greater financial stability and extensive experience with vehicle ownership, leading them to prioritize practical concerns such as reliability and ongoing maintenance over the initial purchase cost. Their decision-making tends to be cautious and value-oriented, focusing on long-term cost-effectiveness rather than symbolic or status-related factors. In contrast to younger buyers who may be drawn to innovation or environmental benefits, middle-aged consumers emphasize economic practicality and dependable upkeep.

The findings of this study indicate that infrastructure readiness exerts a significant direct influence on consumers' intention to purchase EVs, with this relationship being partially mediated by consumer attitude. This suggests that the availability, accessibility, and reliability of charging infrastructure not only facilitate functional adoption but also shape psychological perceptions, thereby enhancing consumers' willingness to embrace EV technology. From the perspective of the VAB model, infrastructure readiness represents an essential functional and situational value that shapes consumers' evaluations of EV practicality (Cheung & To, 2019 [33]). When charging facilities are sufficient, accessible, and conveniently located, consumers perceive EV ownership as feasible and convenient, which directly enhances their intention to purchase. At the same time, adequate infrastructure strengthens positive attitudes toward EVs by reducing perceived barriers such as limited driving range and charging inconvenience. As a result, consumers who recognize the availability of supportive infrastructure tend to develop favourable attitudes toward EVs, which subsequently reinforce their behavioural intentions.

This mediating role of attitude is consistent with the TPB, which posits that attitudes toward a behaviour are a primary determinant of intention. Thus, infrastructure readiness exerts both a direct practical effect and an indirect psychological effect on purchase intention. The direct effect arises from consumers' evaluation of convenience and feasibility, while the indirect effect operates through the formation of positive attitudes that strengthen their motivation to adopt EVs.

These findings are consistent with empirical evidence in Malaysia and other contexts. For instance, Mohd Noor et al. (2025 [53]) found that infrastructure readiness significantly influences consumers' intention to purchase EVs both directly and indirectly through attitude. Similarly, Salari Sa(2022 [88]) and Chaturvedi et al. (2023 [34]) reported that perceived adequacy of charging infrastructure enhances consumers' attitudes and intentions toward EV adoption. Moreover, a national report by Funke et al. (2019 [89]) highlighted that concerns over limited charging infrastructure remain one of the main barriers to EV adoption, reinforcing the importance of strengthening both the physical infrastructure and public perception of readiness.

The findings of this study confirm that attitude is significantly related to consumers' intention to purchase electric vehicles (EVs). This result aligns with the fundamental assumptions of the TPB (Ajzen, 1991 [32]), which posits that attitude toward a behaviour represents an individual's overall positive or negative evaluation of performing that behaviour and serves as a key predictor of behavioural intention. In the context of EV adoption, a positive attitude reflects consumers' favourable evaluations of EVs' benefits, such as environmental friendliness, cost efficiency, technological innovation, and alignment with personal values (Barbarossa et al., 2017 [90]; Gupta et al., 2024 [91]). These favourable evaluations enhance consumers' willingness to engage in purchase-related behaviour.

From the VAB model perspective, attitude functions as a psychological bridge between consumers' perceived values and their behavioural intentions (Homer & Kahle, 1988 [31]). Consumers who perceive that EVs deliver high functional, social, or environmental value are more likely to develop positive attitudes toward them, which subsequently translate into stronger intentions to purchase. Therefore, attitude not only captures the affective evaluation of EVs but also reflects the internalization of consumers' value perceptions into behavioural motivation.

Empirical evidence consistently demonstrates a strong and positive association between consumer attitude and purchase intention in the context of EVs. Studies by Adnan et al. (2018 [92]), Sahoo et al. (2022 [52]), Cattaneo, (2019) and Chaturvedi et al. (2023 [34,93]) affirm that individuals with more favourable attitudes toward EVs are significantly more inclined to consider purchasing or adopting them. Such positive attitudes are shaped by consumers' recognition of both tangible and intangible benefits of EV ownership, including environmental sustainability, long-term economic savings, enhanced driving performance, and supportive government incentives (Femina & Santhi, 2024 [94]). These perceived advantages contribute to emotional and cognitive endorsement of EVs, thereby strengthening purchase intention.

6. Theoretical and Managerial Implications

6.1. Theoretical Contributions

First, this research advances theoretical understanding by integrating the VAB model and the TPB into a single explanatory framework. While the TPB primarily explains behavioural intention through attitudinal and control-based determinants, the VAB model emphasizes how underlying value perceptions shape attitudes and, consequently, behaviours. By combining these frameworks, the present study provides a more comprehensive theoretical model that links value-based antecedents (price, maintenance cost, and infrastructure readiness) to attitudinal and intentional outcomes. This integration bridges the conceptual gap between evaluative values and behavioural intentions, thereby extending the theoretical boundaries of both VAB and TPB in explaining pro-environmental purchase behaviour.

Second, the study extends the application of the VAB model to the context of EV adoption, which remains underexplored in the literature. Earlier studies using the VAB framework have mainly focused on ethical, environmental, or tourism-related decisions. By conceptualizing price and maintenance cost as economic values and infrastructure readiness as a contextual or functional value, this study broadens the theoretical scope of the VAB model. It demonstrates that consumers' evaluations of affordability, operational cost, and infrastructural support meaningfully shape their attitudes toward EVs, thereby confirming that economic and infrastructural factors represent key value-based antecedents in the green technology domain.

Third, the findings underscore the mediating role of attitude in the relationships between price, maintenance cost, infrastructure readiness, and purchase intention. The results reveal that attitude functions as a critical psychological mechanism through which value perceptions translate into behavioural intention. This outcome refines the attitudinal pathway proposed in TPB and strengthens the argument that consumers' positive attitudes act as a conduit linking perceived value with purchase intention.

6.2. Practical Contributions

From the practical viewpoint, several implications are offered by this study. First, the findings highlight the crucial role maintenance cost as determinants of consumers' purchase intention through their influence on attitudes. This suggests that manufacturers and service

providers of EVs should prioritize initiatives that minimize and transparently convey anticipated maintenance costs. This can include providing extended warranty options, cost-effective service plans, and leveraging predictive maintenance tools. Promotional efforts should emphasize the long-term financial benefits of reduced upkeep compared to traditional vehicles, with a particular focus on appealing to budget-conscious buyers.

Second, the significant role of infrastructure readiness underscores the importance of developing an accessible and reliable charging infrastructure network. The results indicate that consumers' confidence in adopting EVs is closely tied to the perceived adequacy of public charging facilities. Therefore, government agencies and private sectors should collaborate to expand charging station coverage, integrate charging systems into urban planning, and ensure interoperability across networks. Third, the mediating influence of attitude suggests that policies and marketing strategies should prioritize initiatives that shape favourable consumer attitudes toward EVs. Awareness campaigns emphasizing environmental benefits, performance improvements, and technological advancements can foster more positive evaluations and strengthen purchase intentions Finally, the findings provide actionable insights for policy formulation and market planning. Governments aiming to accelerate EV adoption can use the integrated model proposed in this study as a diagnostic framework to assess which value dimensions, i.e., economic, infrastructural, or attitudinal most strongly influence purchase intention in their local context. Such evidence-based policy design can lead to more efficient allocation of resources and targeted interventions that maximize public uptake of EVs.

6.3. Limitations and Recommendations for Future Research

Despite its meaningful theoretical and practical contributions, this study is subject to certain limitations. Primarily, the use of a cross-sectional research design restricts the analysis to consumer perceptions and behavioural intentions at a single point in time. Consequently, the ability to draw definitive causal inferences among the variables is limited. To address this, future research could adopt longitudinal or experimental designs to explore how consumer attitudes and intentions toward electric vehicle (EV) adoption evolve over time or in response to policy shifts, technological advancements, and market dynamics.

Second, the data were collected from respondents within a specific geographical and cultural context, which may limit the generalizability of the findings to other regions or countries. Future research should consider cross-country comparative studies or multi-regional samples to validate and extend the applicability of the integrated VAB model and TPB model across diverse settings. Third, the current study focused on three antecedent factors namely price, maintenance cost, and infrastructure readiness which representing economic and contextual values. While these factors are essential, consumers' purchase decisions may also be influenced by other dimensions such as environmental concern, perceived risk, technological trust, or social influence. Future studies are encouraged to incorporate additional psychological, social, and environmental variables to enhance the explanatory power of the model and capture the multifaceted nature of EV adoption behaviour.

7. Conclusions

This study successfully identified the latent constructs that significantly influence consumers' intention to purchase EVs. Through the analysis of structural equation modelling (SEM) using SmartPLS 4.0, this study provides a comprehensive understanding of the behavioural decision-making process in the context of EV adoption. Key determinants, including attitudes, maintenance costs, and infrastructure readiness were found to play critical roles in shaping consumer choices, highlighting both psychological and

economic factors that drive purchase intentions. The findings offer valuable insights for policymakers, EV manufacturers, and marketers, suggesting that strategies targeting consumers' perceived affordability, convenience, and positive attitudes toward EVs may enhance adoption rates. Additionally, by demonstrating the relative importance of different constructs, this study provides a framework for future research to explore other psychological, social, and environmental variables in influencing EV purchase behaviour. Overall, the study contributes both theoretically and practically by integrating economic and infrastructural related factors, offering a holistic perspective on consumer adoption of sustainable transportation technologies.

Author Contributions: N.A.M.N.: She conceptualized the research idea and was responsible for developing the introduction, literature review, and the final version of the manuscript; A.M. contributed to the data collection process, with assistance from F.M.I.; M.F.S. handled the study's methodological design and discussion of implications, while T.N.A.T.A. conducted the data analysis. All authors have read and agreed to the published version of the manuscript.

Funding: This research was fully funded by the Ministry of Higher Education (MOHE) Malaysia through Fundamental Research Grant Scheme (FRGS/1/2023/SS01/UUM/01/1) with project ID 472183-501135.

Institutional Review Board Statement: The Ethics Committee of the School of Business Management, Universiti Utara Malaysia waived the need for ethics approval for this study, as the data collected through non-invasive questionnaires and does not involve sensitive populations, medical procedures, or personal health data.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author. The data are not publicly available due to privacy and confidentiality considerations.

Acknowledgments: This study was supported and funded by the Ministry of Higher Education (MOHE) Malaysia through Fundamental Research Grant Scheme (FRGS/1/2023/SS01/UUM/01/1) with project ID 472183-501135; FRGS 2023-1 and SO Code: 21573.

Conflicts of Interest: The authors declare no conflicts of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

Abbreviations

The following abbreviations are used in this manuscript:

EVs	Electric Vehicles
TPB	Theory of Planned Behaviour
VAB	Value–Attitude–Behaviour
CFVs	Conventional Fuel Vehicles

References

1. Lashari, Z.A.; Ko, J.; Jang, J. Consumers' Intention to Purchase Electric Vehicles: Influences of User Attitude and Perception. *Sustainability* **2021**, *13*, 6778. [CrossRef]
2. Degirmenci, K.; Breitner, M.H. Consumer Purchase Intentions for Electric Vehicles: Is Green More Important than Price and Range? *Transp. Res. Part D Transp. Environ.* **2017**, *51*, 250–260. [CrossRef]
3. Rafiq, F.; Parthiban, E.S.; Rajkumari, Y.; Adil, M.; Nasir, M.; Dogra, N. From Thinking Green to Riding Green: A Study on Influencing Factors in Electric Vehicle Adoption. *Sustainability* **2023**, *16*, 194. [CrossRef]
4. Wang, N.; Tian, H.; Zhu, S.; Li, Y. Analysis of Public Acceptance of Electric Vehicle Charging Scheduling Based on the Technology Acceptance Model. *Energy* **2022**, *258*, 124804. [CrossRef]

5. Ivanova, G.; Moreira, A.C. Antecedents of Electric Vehicle Purchase Intention from the Consumer's Perspective: A Systematic Literature Review. *Sustainability* **2023**, *15*, 2878. [CrossRef]
6. Ramachandaran, S.D.; Ng, H.; Rajermani, R.; Raman, A. Factors Influencing Consumer's Adoption of Electric Car in Malaysia. *TEM J.* **2023**, *12*, 2603–2611. [CrossRef]
7. Chang, X.H.; Liu, Y. Quantized Output Feedback Control of AFS for Electric Vehicles with Transmission Delay and Data Dropouts. *IEEE Trans. Intell. Transp. Syst.* **2022**, *23*, 16026–16037. [CrossRef]
8. Chang, X.H.; Liu, X.M.; Hou, L.W.; Qi, J.H. Quantized Fuzzy Feedback Control for Electric Vehicle Lateral Dynamics. *IEEE Trans. Syst. Man Cybern. Syst.* **2024**, *54*, 2331–2341. [CrossRef]
9. Ahmad, S.; Chaveeesuk, S.; Chaiyasoonthorn, W. The Adoption of Electric Vehicle in Thailand with the Moderating Role of Charging Infrastructure: An Extension of a UTAUT. *Int. J. Sustain. Energy* **2024**, *43*, 2387908. [CrossRef]
10. Wang, Y.; Chi, Y.; Xu, J.H.; Yuan, Y. Consumers' Attitudes and Their Effects on Electric Vehicle Sales and Charging Infrastructure Construction: An Empirical Study in China. *Energy Policy* **2022**, *165*, 112983. [CrossRef]
11. Haustein, S.; Jensen, A.F. Factors of Electric Vehicle Adoption: A Comparison of Conventional and Electric Car Users Based on an Extended Theory of Planned Behaviour. *Int. J. Sustain. Transp.* **2018**, *12*, 484–496. [CrossRef]
12. Kim, J.H.; Lee, G.; Park, J.Y.; Hong, J.; Park, J. Consumer intentions to purchase battery electric vehicles in Korea. *Energy Policy* **2019**, *132*, 736–743. [CrossRef]
13. Taamneh, M.M.; Makahleh, H.Y. The Prospects of Adopting Electric Vehicles in Urban Contexts: A Systematic Review of Literature. *Transp. Res. Interdiscip. Perspect.* **2025**, *31*, 101420. [CrossRef]
14. Adepetu, A.; Keshav, S. The Relative Importance of Price and Driving Range on Electric Vehicle Adoption: Los Angeles Case Study. *Transportation* **2017**, *44*, 353–373. [CrossRef]
15. Tissayakorn, K. Consumers' Decisions to Purchase Electric Vehicles in Bangkok, Thailand. *Case Stud. Transp. Policy* **2025**, *21*, 101536. [CrossRef]
16. Xia, Z.; Wu, D.; Zhang, L. Economic, Functional, and Social Factors Influencing Electric Vehicles' Adoption: An Empirical Study Based on the Diffusion of Innovation Theory. *Sustainability* **2022**, *14*, 6283. [CrossRef]
17. Muzir, N.A.Q.; Mojumder, M.R.H.; Hasanuzzaman, M.; Selvaraj, J. Challenges of Electric Vehicles and Their Prospects in Malaysia: A Comprehensive Review. *Sustainability* **2022**, *14*, 8320. [CrossRef]
18. Ajzen, I.; Fishbein, M.; Lohmann, S.; Albarracín, D. The Influence of Attitudes on Behaviour. In *The Handbook of Attitudes*; Albarracín, D., Johnson, B.T., Eds.; Routledge/Taylor & Francis: New York, NY, USA, 2018; Volume 1, pp. 197–255.
19. Chawla, D.; Joshi, H. Consumer Attitude and Intention to Adopt Mobile Wallet in India–An Empirical Study. *Int. J. Bank Mark.* **2019**, *37*, 1590–1618. [CrossRef]
20. Emon, M.M.H.; Khan, T. The Mediating Role of Attitude Towards the Technology in Shaping Artificial Intelligence Usage Among Professionals. *Telematics Inform. Rep.* **2025**, *17*, 100188. [CrossRef]
21. Carrión-Bósquez, N.G.; Ortiz-Regalado, O.; Veas-González, I.; Naranjo-Armijo, F.G.; Guerra-Regalado, W.F. The Mediating Role of Attitude and Environmental Awareness in the Influence of Green Advertising and Eco-Labels on Green Purchasing Behaviours. *Span. J. Mark.* **2025**, *29*, 330–350. [CrossRef]
22. Ajzen, I.; Cote, N.G. Attitudes and the Prediction of Behaviour. In *Attitudes and Attitude Change*; Crano, W.D., Prislin, R., Eds.; Psychology Press: New York, NY, USA, 2008; pp. 289–305.
23. Tiwari, S.; Mentel, G.; Mohammed, K.S.; Rehman, M.Z.; Lewandowska, A. Unveiling the Role of Natural Resources, Energy Transition and Environmental Policy Stringency for Sustainable Environmental Development: Evidence from BRIC+1. *Resour. Policy* **2024**, *96*, 105204. [CrossRef]
24. Buhmann, K.M.; Rialp-Criado, J.; Rialp-Criado, A. Predicting consumer intention to adopt battery electric vehicles: Extending the theory of planned behaviour. *Sustainability* **2024**, *16*, 1284. [CrossRef]
25. García de Blanes Sebastián, M.; Sarmiento Guede, J.R.; Azuara Grande, A.; Juárez-Varón, D. Analysis of Factors Influencing Attitude and Intention to Use Electric Vehicles for a Sustainable Future. *J. Technol. Transfer* **2024**, *49*, 1347–1368. [CrossRef]
26. Salon, D.; Breetz, H.L.; Wiers, H.; King, D.A. Electric Vehicles for All? Opportunities and Challenges for Large-Scale Adoption. *Transp. Res. Part D Transp. Environ.* **2025**, *144*, 104776. [CrossRef]
27. Bösehans, G.; Bell, M.; Thorpe, N.; Dissanayake, D. Something for everyone? An investigation of people's intention to use different types of shared electric vehicle. *Travel Behav. Soc.* **2023**, *30*, 178–191. [CrossRef]
28. Singh, S.; Ru, J. Goals of Sustainable Infrastructure, Industry, and Innovation: A Review and Future Agenda for Research. *Environ. Sci. Pollut. Res.* **2023**, *30*, 28446–28458. [CrossRef] [PubMed]
29. Hakam, D.F.; Jumayla, S. Electric Vehicle Adoption in Indonesia: Lesson Learned from Developed and Developing Countries. *Sustain. Futures* **2024**, *8*, 100348. [CrossRef]
30. Jaiswal, D.; Kaushal, V.; Deshmukh, A.K.; Kant, R.; Kautish, P. What Drives Electric Vehicles in an Emerging Market? *Mark. Intell. Plan.* **2022**, *40*, 738–754. [CrossRef]

31. Homer, P.M.; Kahle, L.R. A Structural Equation Test of the Value–Attitude–Behaviour Hierarchy. *J. Pers. Soc. Psychol.* **1988**, *54*, 638–646. [CrossRef]
32. Ajzen, I. The Theory of Planned Behaviour. *Organ. Behav. Hum. Decis. Process.* **1991**, *50*, 179–211. [CrossRef]
33. Cheung, M.F.Y.; To, W.M. An Extended Model of Value-Attitude-Behaviour to Explain Chinese Consumers' Green Purchase Behaviour. *J. Retailing Consum. Serv.* **2019**, *50*, 145–153. [CrossRef]
34. Chaturvedi, P.; Kulshreshtha, K.; Tripathi, V.; Agnihotri, D. Exploring Consumers' Motives for Electric Vehicle Adoption: Bridging the Attitude–Behaviour Gap. *Benchmarking Int. J.* **2023**, *30*, 4174–4192. [CrossRef]
35. Shalender, K.; Sharma, N. Integrating Strategic Flexibility and Marketing System to Achieve Sustainable Competitive Advantage: Conceptual Refinement and Framework. *World Rev. Entrep. Manag. Sustain. Dev.* **2022**, *18*, 175–194. [CrossRef]
36. Wang, S.; Fan, J.; Zhao, D.; Yang, S.; Fu, Y. Predicting Consumers' Intention to Adopt Hybrid Electric Vehicles: Using an Extended Version of the Theory of Planned Behaviour Model. *Transportation* **2016**, *43*, 123–143. [CrossRef]
37. Liu, R.; Ding, Z.; Wang, Y.; Jiang, X.; Jiang, X.; Sun, W.; Liu, M. The Relationship between Symbolic Meanings and Adoption Intention of Electric Vehicles in China: The Moderating Effects of Consumer Self-Identity and Face Consciousness. *J. Clean. Prod.* **2021**, *288*, 125116. [CrossRef]
38. Barth, M.; Jugert, P.; Fritsche, I. Still under detected—Social norms and collective efficacy predict the acceptance of electric vehicles in Germany. *Transp. Res. Part F Traffic Psychol. Behav.* **2016**, *37*, 64–77. [CrossRef]
39. Dutta, B.; Hwang, H.G. Consumers' Purchase Intentions of Green Electric Vehicles: The Influence of Consumers Technological and Environmental Considerations. *Sustainability* **2021**, *13*, 12025. [CrossRef]
40. Kim, S.Y.; Kang, M.J. A Study on the Factors Influencing the Purchase of Electric Vehicles. *Int. J. Internet Broadcast. Commun.* **2022**, *14*, 194–200. [CrossRef]
41. Krishnan, V.V.; Koshy, B.I. Evaluating the Factors Influencing Purchase Intention of Electric Vehicles in Households Owning Conventional Vehicles. *Case Stud. Transp. Policy* **2021**, *9*, 1122–1129. [CrossRef]
42. Adnan, N.; Nordin, S.M.; Rahman, I.; Amini, M.H. A Market Modelling Review Study on Predicting Malaysian Consumer Behaviour towards Widespread Adoption of PHEV/EV. *Environ. Sci. Pollut. Res.* **2017**, *24*, 17955–17975. [CrossRef]
43. Suttakul, P.; Wongsapai, W.; Fongsamootr, T.; Mona, Y.; Poolsawat, K. Total Cost of Ownership of Internal Combustion Engine and Electric Vehicles: A Real-World Comparison for the Case of Thailand. *Energy Rep.* **2022**, *8*, 545–553. [CrossRef]
44. Hopkins, E.; Potoglou, D.; Orford, S.; Cipcigan, L. Can the Equitable Roll Out of Electric Vehicle Charging Infrastructure Be Achieved? Renew. *Sustain. Energy Rev.* **2023**, *182*, 113398. [CrossRef]
45. Pamidimukkala, A.; Kermanshachi, S.; Rosenberger, J.M.; Hladik, G. Evaluation of Barriers to Electric Vehicle Adoption: A Study of Technological, Environmental, Financial, and Infrastructure Factors. Transp. *Res. Interdiscip. Perspect.* **2023**, *22*, 100962. [CrossRef]
46. Ledna, C.; Muratori, M.; Brooker, A.; Wood, E.; Greene, D. How to Support EV Adoption: Trade-offs between Charging Infrastructure Investments and Vehicle Subsidies in California. *Energy Policy* **2022**, *165*, 112931. [CrossRef]
47. Burra, L.T.; Al-Khasawneh, M.B.; Cirillo, C. Impact of charging infrastructure on electric vehicle adoption: A synthetic population approach. *Travel Behav. Soc.* **2024**, *37*, 100834. [CrossRef]
48. Faustino, F.J.; Lopes, J.C.; Melo, J.D.; Sousa, T.; Padilha-Feltrin, A.; Brito, J.A.; Garcia, C.O. Identifying Charging Zones to Allocate Public Charging Stations for Electric Vehicles. *Energy* **2023**, *283*, 128436. [CrossRef]
49. Potoglou, D.; Song, R.; Santos, G. Public Charging Choices of Electric Vehicle Users: A Review and Conceptual Framework. *Transp. Res. Part D Transp. Environ.* **2023**, *121*, 103824. [CrossRef]
50. Li, X.; Jenn, A. An Integrated Optimization Platform for Spatial–Temporal Modelling of Electric Vehicle Charging Infrastructure. *Transp. Res. Part D Transp. Environ.* **2022**, *104*, 103177. [CrossRef]
51. Low, J.M.; Haszeldine, R.S.; Mouli-Castillo, J. Refuelling Infrastructure Requirements for Renewable Hydrogen Road Fuel through the Energy Transition. *Energy Policy* **2023**, *172*, 113300. [CrossRef]
52. Sahoo, D.; Harichandan, S.; Kar, S.K. An Empirical Study on Consumer Motives and Attitude towards Adoption of Electric Vehicles in India: Policy Implications for Stakeholders. *Energy Policy* **2022**, *165*, 112941. [CrossRef]
53. Mohd Noor, N.A.; Muhammad, A.; Isa, F.M.; Shamsudin, M.F.; Abaidah, T.N.A.T. The Electric Vehicle (EV) Revolution: How Consumption Values, Consumer Attitudes, and Infrastructure Readiness Influence the Intention to Purchase Electric Vehicles in Malaysia. *World Electr. Veh. J.* **2025**, *16*, 556. [CrossRef]
54. Adu-Gyamfi, G.; Song, H.; Obuobi, B.; Nketiah, E.; Wang, H.; Cudjoe, D. Who Will Adopt? Investigating the Adoption Intention for Battery Swap Technology for Electric Vehicles. *Renew. Sustain. Energy Rev.* **2022**, *156*, 111979. [CrossRef]
55. Toukabri, M.; Boutaleb, B. Assessing Factors Impacting Electric Vehicle Adoption in Saudi Arabia: Insights on Willingness to Pay, Environmental Awareness, and Perceived Risk. *Eng. Technol. Appl. Sci. Res.* **2025**, *15*, 19729–19736. [CrossRef]
56. Afroz, R.; Rahman, A.; Masud, M.M.; Akhtar, R.; Duasa, J.B. How Individual Values and Attitude Influence Consumers' Purchase Intention of Electric Vehicles-Some Insights from Kuala Lumpur, Malaysia. *Environ. Urban. Asia* **2015**, *6*, 193–211. [CrossRef]

57. Ali, I.; Naushad, M. Insights on Electric Vehicle Adoption: Does Attitude Play a Mediating Role. *Innov. Mark.* **2022**, *18*, 104–116. [CrossRef]
58. Hu, X.; Yusof, R.N.R.; Mansor, Z.D. Consumers' Purchase Intentions Towards New Energy Vehicles Based on the Theory of Planned Behaviour on Perceived Value: An Empirical Survey of China. *World Electr. Veh. J.* **2025**, *16*, 120. [CrossRef]
59. Gautam, D.; Bolia, N. Understanding Consumer Choices and Attitudes Toward Electric Vehicles: A Study of Purchasing Behaviour and Policy Implications. *Sustain. Dev.* **2024**, *32*, 4895–4915. [CrossRef]
60. Farinloye, T.; Oluwatobi, O.; Ugboma, O.; Dickson, O.F.; Uzondu, C.; Mogaji, E. Driving the Electric Vehicle Agenda in Nigeria: The Challenges, Prospects and Opportunities. *Transp. Res. Part D Transp. Environ.* **2024**, *130*, 104182. [CrossRef]
61. Qian, J.; Li, X. Perceived Value, Place Identity, and Behavioral Intention: An Investigation on the Influence Mechanism of Sustainable Development in Rural Tourism. *Sustainability* **2024**, *16*, 1583. [CrossRef]
62. Sepe, F.; Luongo, S.; di Gioia, L.; Della Corte, V. Cultural Heritage Experiences in the Metaverse: Analyzing Perceived Value and Behavioral Intentions. *Eur. J. Innov. Manag.* **2025**, *28*, 2054–2079. [CrossRef]
63. An, K.P.C.; Kamaruddin, N.K. The Relationship between Perceived Benefit and Perceived Risk Toward Electric Vehicle (EV) Purchase Intention Among Consumers in Kuala Lumpur, Malaysia. *Res. Manag. Technol. Bus.* **2024**, *5*, 346–364.
64. Umair, M.; Hidayat, N.M.; Nik Ali, N.H.; Hakomori, T.; Abdullah, E. A Review of Malaysia's Current State and Future in Electric Vehicles. *J. Sustain. Dev. Energy Water Environ. Syst.* **2024**, *12*, 1–35. [CrossRef]
65. Esteves, J.; Alonso-Martínez, D.; de Haro, G. Profiling Spanish Prospective Buyers of Electric Vehicles Based on Demographics. *Sustainability* **2021**, *13*, 9223. [CrossRef]
66. Ji, D.; Gan, H. Effects of Providing Total Cost of Ownership Information on Below-40 Young Consumers' Intent to Purchase an Electric Vehicle: A Case Study in China. *Energy Policy* **2022**, *165*, 112954. [CrossRef]
67. De Luca, S.; Storani, F.; Bruno, F.; di Pace, R. Adoption of Electric Vehicles by Young Adults in an Emerging Market: A Case Study from Argentina. *Transp. Plan. Technol.* **2024**, *47*, 226–257. [CrossRef]
68. Hair, J.F.; Matthews, L.M.; Matthews, R.L.; Sarstedt, M. PLS-SEM or CB-SEM: Updated Guidelines on Which Method to Use. *Int. J. Multivar. Data Anal.* **2017**, *1*, 107–123. [CrossRef]
69. Ahmed, S.K. How to Choose a Sampling Technique and Determine Sample Size for Research: A Simplified Guide for Researchers? *Oral Oncol. Rep.* **2024**, *12*, 100662. [CrossRef]
70. Rahman, M.M.; Tabash, M.I.; Salamzadeh, A.; Abduli, S.; Rahaman, M.S. Sampling Techniques (Probability) for Quantitative Social Science Researchers: A Conceptual Guidelines with Examples. *SEEU Rev.* **2022**, *17*, 42–51. [CrossRef]
71. Holtom, B.; Baruch, Y.; Aguinis, H.; Ballinger, G.A. Survey response rates: Trends and a validity assessment framework. *Hum. Relat.* **2022**, *75*, 1560–1584. [CrossRef]
72. Loudiyi, H.; Chetioui, Y.; Lebdaoui, H. Economics of Electric Vehicle Adoption: An Integrated Framework for Investigating the Antecedents of Perceived Value and Purchase Intent. *Int. J. Econ. Financ. Issues* **2022**, *12*, 29–38. [CrossRef]
73. Ackaah, W.; Kanton, A.T.; Osei, K.K. Factors Influencing Consumers' Intentions to Purchase Electric Vehicles in Ghana. *Transp. Lett.* **2022**, *14*, 1031–1042. [CrossRef]
74. Sang, Y.N.; Beckhet, A.B. Exploring Factors Influencing Electric Vehicle Usage Intention: An Empirical Study in Malaysia. *Int. J. Bus. Soc.* **2015**, *16*, 57–74. [CrossRef]
75. Pallant, J. *SPSS Survival Manual: A Step by Step Guide to Data Analysis Using IBM SPSS*; Routledge: London, UK, 2020.
76. Hair, J.F.; Risher, J.J.; Sarstedt, M.; Ringle, C.M. When to Use and How to Report the Results of PLS-SEM. *Eur. Bus. Rev.* **2019**, *31*, 2–24. [CrossRef]
77. Hair, J.F.; Ringle, C.M.; Sarstedt, M. PLS-SEM: Indeed a Silver Bullet. *J. Mark. Theory Pract.* **2011**, *19*, 139–152. [CrossRef]
78. Henseler, J.; Ringle, C.M.; Sarstedt, M. A New Criterion for Assessing Discriminant Validity in Variance-Based Structural Equation Modelling. *J. Acad. Mark. Sci.* **2015**, *43*, 115–135. [CrossRef]
79. Fornell, C.; Larcker, D.F. Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *J. Mark. Res.* **1981**, *18*, 39–50. [CrossRef]
80. Hair, J.F.; Money, A.H.; Samouel, P.; Page, M. Research Methods for Business. *Educ. Train.* **2007**, *49*, 336–337. [CrossRef]
81. Cohen, J. *Statistical Power Analysis for the Behavioural Sciences*, 2nd ed.; Lawrence Erlbaum: Hillsdale, NJ, USA, 1988. [CrossRef]
82. Thananusak, T.; Rakthin, S.; Tavewatanaphan, T.; Punnakitikashem, P. Factors Affecting the Intention to Buy Electric Vehicles: Empirical Evidence from Thailand. *Int. J. Electr. Hybrid Veh.* **2017**, *9*, 361–381. [CrossRef]
83. Chenayah, S.; Devadason, E.S.; Goh, L.T. Adoption of Electric Vehicles in Malaysia—Consumer Preferences and Cost-Benefit Considerations. *Singapore Econ. Rev.* **2024**, *69*, 1395–1414. [CrossRef]
84. He, J.; Chen, X.; Ma, M.; Gao, M. Electric Vehicle Rental Battery Replacement and Maintenance Decisions. *Energy* **2025**, *333*, 137460. [CrossRef]
85. Pandak, I.; Piaralal, S.K.; Rethina, V.S. Investigating the Moderating Role of Government Incentive Policy on Consumer Adoption of Battery Electric Vehicles (BEV) in Malaysia. *Int. J. Acad. Res. Bus. Soc. Sci.* **2024**, *14*, 901–917. [CrossRef]

86. Song, M.R.; Chu, W.; Im, M. The Effect of Cultural and Psychological Characteristics on the Purchase Behaviour and Satisfaction of Electric Vehicles: A Comparative Study of US and China. *Int. J. Consum. Stud.* **2022**, *46*, 345–364. [CrossRef]
87. Purwanto, E.; Irawan, A.P. The Willingness to Purchase Electric Vehicles: A Comprehensive Review. *IOP Conf. Ser. Earth Environ. Sci.* **2024**, *1324*, 012091. [CrossRef]
88. Salari, N. Electric vehicles adoption behaviour: Synthesising the technology readiness index with environmentalism values and instrumental attributes. *Transp. Res. Part A Policy Pract.* **2022**, *164*, 60–81. [CrossRef]
89. Funke, S.Á.; Sprei, F.; Gnann, T.; Plötz, P. How Much Charging Infrastructure Do Electric Vehicles Need? A Review of the Evidence and International Comparison. *Transp. Res. Part D Transp. Environ.* **2019**, *77*, 224–242. [CrossRef]
90. Barbarossa, C.; de Pelsmacker, P.; Moons, I. Personal Values, Green Self-Identity and Electric Car Adoption. *Ecol. Econ.* **2017**, *140*, 190–200. [CrossRef]
91. Gupta, S.; Bansal, R.; Bankoti, N.; Kar, S.K.; Mishra, S.K.; Kaur, P.; Harichandan, S. Factors Affecting Consumer's Intention to Use Electric Vehicles: Mediating Role of Awareness and Knowledge. *J. Adv. Transp.* **2024**, *2024*, 5922430. [CrossRef]
92. Adnan, N.; Nordin, S.M.; Rahman, I.; Vasant, P.; Noor, M.A. An Overview of Electric Vehicle Technology: A Vision towards Sustainable Transportation. In *Intelligent Transportation and Planning: Breakthroughs in Research and Practice*; IGI Global: Hershey, PA, USA, 2018; pp. 292–309. [CrossRef]
93. Cattaneo, C. Internal and external barriers to energy efficiency: Which role for policy interventions? *Energy Efficiency* **2019**, *12*, 1293–1311. [CrossRef]
94. Femina, E.P.; Santhi, P. Effects of Perceived Value Dimensions on Customer Brand Loyalty Towards Luxury Cars. *Rajagiri Manag. J.* **2024**, *18*, 274–286. [CrossRef]

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