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Examining Factors Influencing Electric Vehicle Adoption Intention in Klang Valley, Malaysia: An Integrated TPB and DOI Perspective

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ABSTRACT

The transition towards electric vehicles (EVs) has become a strategic priority in achieving sustainable transportation and reducing carbon emissions. Despite various government initiatives and policy incentives introduced to accelerate EV adoption in Malaysia, consumer acceptance remains relatively low compared to other countries in the region. This study examines the factors influencing consumers' intention to adopt electric vehicles in Klang Valley, Malaysia, by integrating the Theory of Planned Behaviour (TPB) and the Diffusion of Innovation (DOI) framework. Specifically, the study investigates the effects of environmental awareness, cost-effectiveness, charging infrastructure, and social influence on EV adoption intention. A quantitative research design was employed using a structured questionnaire distributed to residents in Klang Valley. After data screening and cleaning, 136 valid responses were analysed using IBM SPSS Statistics Version 28. Descriptive statistics, reliability analysis, Pearson correlation, and multiple regression analysis were performed to examine the proposed relationships. The findings reveal that the regression model explains 56.9% of the variance in EV adoption intention. Cost-effectiveness emerged as the strongest positive predictor, followed by social influence, while charging infrastructure demonstrated a significant but negative relationship when controlling for other variables. Environmental awareness, although positively associated with EV adoption intention, was not found to be statistically significant. These findings suggest that Malaysian consumers prioritise economic benefits and social influences over environmental considerations when making vehicle purchasing decisions. The study contributes to the existing literature by providing updated empirical evidence on EV adoption in Malaysia through an integrated TPB–DOI perspective and offers practical implications for policymakers, automotive manufacturers, and infrastructure providers in developing more effective strategies to accelerate the transition towards sustainable mobility.

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1. Introduction

The transition from internal combustion engine vehicles to electric vehicles (EVs) has become a central component of contemporary efforts to decarbonise road transport, improve urban air quality and reduce dependence on fossil fuels. This transition has moved beyond a niche technological development, as global electric car sales exceeded 17 million units in 2024 and accounted for more than 20% of all new cars sold worldwide. Nevertheless, adoption remains uneven across markets because the availability of affordable models, charging infrastructure, policy support and consumer confidence differs substantially between countries. The experience of emerging economies is especially important because consumers in these markets are generally more sensitive to vehicle prices, operating costs and infrastructural constraints than those in mature EV markets [1].

Southeast Asia is emerging as an important growth region for electric mobility. Electric car sales in the region increased by nearly 50% in 2024 and represented approximately 9% of total car sales, although progress varied considerably among individual countries. The regional experience indicates that EV adoption is not driven by technology alone. Competitive vehicle pricing, domestic manufacturing capacity, government incentives and the availability of reliable charging services collectively shape the rate at which consumers accept electric mobility [1]. These developments have intensified the need for country-specific research because factors that promote EV adoption in established markets may not operate in the same manner in emerging economies.

Malaysia has introduced several initiatives to develop its electric mobility ecosystem. The National Automotive Policy 2020 recognises electric and next-generation vehicles as strategically important technologies and promotes investment in high-value automotive activities, critical components and local technological capabilities. Malaysia's wider policy direction has also included fiscal incentives, industrial investment support and charging infrastructure development. These measures reflect the government's intention to strengthen the domestic automotive industry while facilitating the transition towards cleaner mobility [2].

Despite this policy momentum, the readiness of Malaysia's EV ecosystem remains a continuing concern. Malaysia had 3,611 public EV charging bays at the end of 2024, compared with the national target of 10,000 charging points. Although the number subsequently increased, the gap between deployed infrastructure and the stated target illustrates that physical availability, geographical coverage and operational convenience remain important challenges. The need to integrate different charging operators into a unified platform further demonstrates that infrastructure readiness is not determined only by the number of chargers, but also by interoperability, accessibility, real-time information and users' confidence that charging services will function when required [3].

Consumer acceptance is therefore essential to the success of Malaysia's EV transition. Vehicle acquisition is a high-involvement decision that requires consumers to evaluate purchase price, financing, operating costs, maintenance, charging convenience, technological uncertainty and long-term usability. Recent Malaysian studies have consequently examined a broad range of explanatory factors. Yusoff et al. [4], for example, evaluated consumer attitudes and determinants of EV adoption among respondents in Selangor, while Asadi et al. [5] combined the Theory of Planned Behaviour with the Norm Activation Model to investigate Malaysian consumers' adoption intentions. Other recent work has examined performance and effort expectancy, environmental consciousness, infrastructure availability and price perceptions in explaining consumers' willingness to adopt EVs [6,7]. Collectively, these studies show that EV adoption is multidimensional rather than the outcome of one economic, environmental or technological factor.

Cost-related considerations remain particularly relevant in an emerging EV market. Although EVs may offer savings through lower energy and maintenance expenditure, consumers must balance

these potential benefits against purchase prices, financing commitments, battery-related uncertainty and the perceived availability of affordable models. Evidence from Malaysia remains mixed. Some studies identify perceived economic value as an important adoption driver, whereas others suggest that price becomes less influential when incentives and expected long-term savings are considered [7]. These inconsistencies suggest that the effect of cost should be examined as perceived cost-effectiveness, incorporating both the financial burden of acquisition and the longer-term value expected from EV ownership.

Charging infrastructure represents another critical but complex consideration. An expanding charging network may improve the perceived practicality of EV ownership, reduce range-related concerns and strengthen consumers' confidence in using an EV for daily and intercity travel. However, the presence of charging points does not automatically guarantee a convenient user experience. Consumers may remain concerned about charger distribution, waiting time, compatibility, maintenance, payment fragmentation and the reliability of real-time availability information. Malaysian evidence continues to identify infrastructure as an important adoption consideration, while national initiatives to improve charging interoperability indicate that qualitative aspects of charging services remain unresolved [3,7].

Environmental awareness is also frequently associated with favourable perceptions of EVs because consumers may regard electrified mobility as a means of reducing local air pollution, fuel consumption and transport emissions. Nevertheless, pro-environmental concern does not necessarily result in purchase intention. EV acquisition requires consumers to convert general environmental values into a costly and practical consumption decision. Consequently, financial affordability, product availability and charging convenience may weaken the direct influence of environmental awareness. Recent Malaysian research reflects this attitude–behaviour tension by showing that environmental and sustainability considerations operate alongside, rather than independently from, functional and economic evaluations [5,7].

Social influence may further shape EV adoption through recommendations, peer behaviour, perceived social approval and the visibility of EV ownership within consumers' personal networks. The Theory of Planned Behaviour proposes that subjective norms influence behavioural intention when individuals perceive that people who are important to them support a particular behaviour [8]. This mechanism is relevant to EVs because consumers may use the experiences of existing owners to reduce uncertainty concerning charging, maintenance, vehicle range and resale value. Recent research applying the Theory of Planned Behaviour to EV purchasing has similarly emphasised the role of salient beliefs and social referents in forming consumer motivation [9].

Klang Valley provides a particularly meaningful setting for examining EV adoption because it represents Malaysia's most developed metropolitan and economic region, encompassing Kuala Lumpur and the highly urbanised areas of Selangor. The region combines a large concentration of potential vehicle consumers with comparatively greater exposure to EV-related infrastructure and services. Importantly, the early development of Malaysia's public charging network was concentrated predominantly in Klang Valley, making it a relatively mature EV environment compared with many other parts of the country. Examining consumers in such a setting therefore provides an important test of whether greater infrastructure exposure and urban readiness are sufficient to translate into stronger EV adoption intentions. Rather than representing Malaysia as a whole, Klang Valley is treated in this study as a strategically relevant urban market in which the behavioural and practical determinants of EV adoption are likely to become visible earlier than in less-developed EV markets.

2. Literature Review and Hypotheses Development

2.1 Theoretical Foundation

This study integrates the Theory of Planned Behaviour (TPB) and Diffusion of Innovation (DOI) theory to explain consumers' intention to adopt electric vehicles (EVs). TPB proposes that behavioural intention is influenced by attitude, subjective norms and perceived behavioural control [8]. In the context of EV adoption, environmental awareness may contribute to a favourable attitude, social influence reflects subjective norms, while cost and charging accessibility affect consumers' perceived ability to own and use an EV. Prior Malaysian research has shown that perceived value, attitude, subjective norms, personal norms and awareness of consequences significantly influence EV purchase intention [5]. More recent evidence also indicates that attitude, perceived behavioural control and subjective norms remain important determinants of EV purchasing motivation [9].

DOI theory explains the adoption of new technology through consumers' perceptions of relative advantage, compatibility, complexity, trialability and observability [10]. In this study, cost-effectiveness represents the relative financial advantage of EV ownership, while charging infrastructure reflects compatibility with consumers' daily travel needs and the practical complexity of using an EV. Environmental awareness and social influence may further shape how consumers evaluate and observe the benefits of electric mobility. Integrating TPB and DOI therefore allows behavioural, social, economic and infrastructural considerations to be examined within a single model.

2.2 Electric Vehicle Adoption Intention

EV adoption intention refers to a consumer's willingness or likelihood to purchase and use an electric vehicle in the future. Behavioural intention is particularly relevant in emerging EV markets because actual ownership remains relatively limited and many consumers have little direct experience with the technology. Consumers must therefore evaluate EVs based on expected financial benefits, environmental value, infrastructure readiness, technological performance and information received from their social environment.

Previous Malaysian studies demonstrate that EV adoption is influenced by multiple considerations rather than a single factor. Sang and Bekhet [11] found that financial benefits, environmental concerns, infrastructure readiness and social influence significantly explained EV usage intention in Malaysia. Subsequent research similarly identified perceived value, subjective norms, environmental responsibility and attitudes as important predictors of purchase intention [5]. More recent studies continue to highlight economic value, charging accessibility, consumer knowledge and social influence as relevant to the development of Malaysia's EV market.

2.3 Environmental Awareness and EV Adoption Intention

Environmental awareness refers to consumers' knowledge and concern regarding environmental deterioration, carbon emissions and the potential environmental benefits of sustainable transportation. Consumers who recognise the environmental consequences of conventional vehicles may develop more favourable attitudes towards EVs because EVs are generally perceived as cleaner alternatives to internal combustion engine vehicles.

Previous research has reported a positive relationship between environmental considerations and EV adoption. Asadi et al. [5] found that awareness of consequences, perceived consumer

effectiveness and personal norms significantly affected Malaysian consumers' EV purchase intention. Environmental concern has also been identified as one of the most important drivers of EV adoption in Malaysia, alongside trust, price value and attitudes towards the technology.

However, environmental awareness does not necessarily translate directly into purchase intention. Consumers may support sustainable mobility but remain unwilling to purchase an EV because of affordability, charging convenience or technological uncertainty. Recent Malaysian evidence suggests that practical and infrastructure-related concerns may outweigh social and emotional values when consumers evaluate EV ownership.

Accordingly, the following hypothesis is proposed:

H1: Environmental awareness has a positive and significant influence on consumers' intention to adopt electric vehicles.

2.4 Cost-Effectiveness and EV Adoption Intention

Cost-effectiveness refers to consumers' evaluation of whether the long-term financial benefits of owning an EV justify its acquisition and operating costs. Although EVs often involve a relatively high initial purchase price, they may provide long-term savings through lower fuel expenditure, reduced maintenance requirements and government incentives. Perceived cost-effectiveness therefore represents an important relative advantage under DOI theory.

Previous studies have consistently identified financial considerations as important in EV adoption decisions. Sang and Bekhet [11] found that financial benefits significantly influenced EV usage intention among Malaysian consumers. Price value was also identified as a major factor influencing EV adoption in later Malaysian research, indicating that consumers assess both acquisition cost and expected returns from ownership.

Recent international evidence similarly shows that financial benefits contribute to EV adoption intention alongside social influence and charging infrastructure [12]. Nevertheless, Malaysian findings are not entirely consistent. Syed Mansor and Anuar [7] reported that price perception was not a significant barrier because incentives, subsidies and expected long-term savings reduced consumers' concerns regarding upfront cost. This suggests that cost should be considered in terms of perceived overall value rather than purchase price alone.

Thus, the following hypothesis is proposed:

H2: Perceived cost-effectiveness has a positive and significant influence on consumers' intention to adopt electric vehicles.

2.5 Charging Infrastructure and EV Adoption Intention

Charging infrastructure refers to consumers' perceptions of the availability, accessibility, reliability and convenience of facilities required to charge an EV. An adequate charging network can reduce range anxiety and increase confidence that an EV can support routine commuting, long-distance travel and other daily mobility requirements.

Infrastructure readiness has long been recognised as an important factor influencing EV adoption in Malaysia. Sang and Bekhet [11] found that infrastructure readiness significantly affected EV usage intention, while more recent Malaysian research identified limited charger availability and accessibility as major concerns among potential users.

The effect of infrastructure, however, extends beyond the number of available charging stations. Charging speed, station reliability, compatibility, payment convenience, geographical distribution and accessibility at homes or workplaces also affect the perceived practicality of EV ownership.

Infrastructure readiness may consequently strengthen the relationship between favourable consumer attitudes and purchase intention by reducing uncertainty and range anxiety.

Nevertheless, empirical findings remain mixed. Some studies report a positive relationship between charging infrastructure and EV adoption, while others suggest that infrastructure becomes less influential once financial, technological or behavioural factors are considered. This inconsistency indicates that perceived infrastructure quality may be more important than the mere visibility or quantity of charging points.

Based on the prevailing theoretical expectation, the following hypothesis is proposed:

H3: Charging infrastructure has a positive and significant influence on consumers' intention to adopt electric vehicles.

2.6 Social Influence and EV Adoption Intention

Social influence refers to the extent to which consumers perceive that family members, friends, colleagues and other important individuals support the adoption of EVs. Within TPB, social influence is closely associated with subjective norms, which represent perceived social pressure to perform or avoid a particular behaviour.

Social influence can be especially important when consumers evaluate unfamiliar and high-value technologies. Recommendations and experiences shared by existing EV owners may reduce uncertainty regarding vehicle performance, charging convenience, maintenance and long-term ownership costs. The visibility of EV ownership may also increase its social desirability and encourage wider diffusion.

Malaysian studies have repeatedly recognised the relevance of social influence. Sang and Bekhet [11] reported that social influence significantly affected EV usage intention, while Asadi et al. [5] found that subjective norms positively influenced purchase intention. Research on battery EV adoption in Malaysia has similarly identified social approval as an important adoption factor.

More recent evidence indicates that subjective norms remain relevant, although their influence may be weaker than attitude and perceived behavioural control. Thwe et al. [9], for example, found that attitude was the strongest determinant of EV purchase intention, followed by perceived behavioural control, moral norms and subjective norms. Cross-country findings also suggest that the strength of social influence may vary according to cultural and market conditions.

Therefore, the following hypothesis is proposed:

H4: Social influence has a positive and significant influence on consumers' intention to adopt electric vehicles.

2.7 Conceptual Framework

The proposed framework integrates behavioural and innovation-related factors to explain EV adoption intention. Environmental awareness reflects consumers' environmental attitudes, while social influence represents normative expectations within their social environment. Cost-effectiveness captures the perceived financial advantage of EV ownership, whereas charging infrastructure represents the practical compatibility and usability of EV technology.

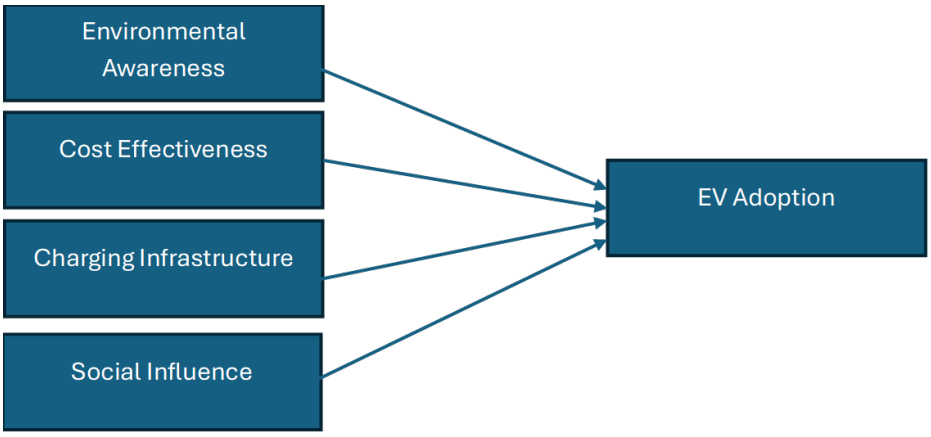

Fig. 1. Proposed conceptual framework

The framework proposes that environmental awareness, cost-effectiveness, charging infrastructure and social influence directly affect consumers' intention to adopt EVs in Klang Valley. Their combined inclusion enables the study to determine whether adoption intention is shaped primarily by environmental beliefs, financial value, infrastructure readiness or social expectations.

3. Research Methodology

3.1 Research Design

This study employed a quantitative, cross-sectional survey design to examine the relationships between environmental awareness, cost-effectiveness, charging infrastructure, social influence and EV adoption intention. A quantitative approach was appropriate because the study aimed to test hypothesised relationships and estimate the relative contribution of several predictors using statistical analysis [13,14]. Data were collected at a single point in time through a structured online questionnaire.

3.2 Population and Sampling

The target population comprised adult residents of Klang Valley who were potential consumers of electric vehicles. Klang Valley was selected because it represents Malaysia's principal urban and economic region and has comparatively greater exposure to EV models, promotional activities and charging facilities.

A non-probability convenience sampling technique was adopted because a comprehensive sampling frame of prospective EV consumers was unavailable. The questionnaire was distributed digitally through platforms such as WhatsApp and other online networks. Participation was restricted to respondents residing in Klang Valley to ensure consistency with the geographical scope of the study. The original methodology confirms the use of an online cross-sectional survey and convenience sampling among Klang Valley residents.

Although the achieved sample was smaller than the sample suggested for estimating population proportions, it exceeded the commonly applied minimum of 10 observations per predictor for multiple regression analysis [15]. With four independent variables, the final sample was therefore considered sufficient for the intended statistical analysis.

3.3 Research Instrument

Data were collected using a self-administered questionnaire developed from established EV adoption literature. The questionnaire contained two main sections. The first section collected respondents' demographic information, including gender, age, income, education, employment status, residential area, vehicle ownership and previous EV experience. The second section measured environmental awareness, cost-effectiveness, charging infrastructure, social influence and EV adoption intention.

All construct items were measured using a five-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree. The final instrument contained 30 measurement items: six items for environmental awareness, six for cost-effectiveness, four for charging infrastructure, six for social influence and six for EV adoption intention. The use of multiple items for each construct improves measurement consistency and reduces dependence on a single indicator [15].

Table 1
Measurement of Study Constructs

Construct	Number of items	Conceptual basis
Environmental awareness	6	Awareness of environmental consequences and perceived ecological benefits of EVs
Cost-effectiveness	6	Purchase cost, operating savings, maintenance expenditure and long-term financial value
Charging infrastructure	4	Availability, accessibility, reliability and convenience of charging facilities
Social influence	6	Influence of family, friends, peers and societal expectations
EV adoption intention	6	Willingness and likelihood of purchasing or using an EV

3.4 Data Collection Procedure

The questionnaire was administered through Google Forms over a two-week period in June 2025. Respondents were informed of the study's purpose and that participation was voluntary. No personally identifiable information was required, and the responses were used solely for academic purposes.

The completed responses were screened for geographical eligibility, completeness and response quality. Responses from individuals residing outside Klang Valley, substantially incomplete questionnaires and cases demonstrating patterned responses were excluded. Data collection and cleaning were conducted before analysis using IBM SPSS Statistics Version 28.

3.5 Data Analysis

Data analysis involved five stages. First, descriptive statistics were used to summarise the respondents' demographic characteristics and the distribution of the study constructs. Second, Cronbach's alpha was calculated to assess internal consistency, with values of 0.70 or above regarded as acceptable [16].

Third, Pearson correlation analysis was conducted to examine the direction and strength of the bivariate relationships between the independent variables and EV adoption intention. Fourth, the assumptions of multiple regression were assessed through residual normality and multicollinearity

diagnostics. Tolerance and variance inflation factor values were examined to determine whether excessive correlations existed among the predictors.

Finally, multiple linear regression was performed to test the four hypotheses and identify the strongest predictor of EV adoption intention. Statistical significance was evaluated at the $p < 0.05$ level. The standardised beta coefficients were used to compare the relative influence of environmental awareness, cost-effectiveness, charging infrastructure and social influence.

4. Results

4.1 Respondent Profile

A total of 136 valid responses were retained for analysis after data screening and cleaning. The respondent profile indicates that the sample was predominantly male, aged between 30 and 49 years, highly educated, employed in the private sector and residing in urban or suburban areas. Most respondents also owned at least one vehicle. However, only 29% had previously test-driven or travelled in an EV, indicating that direct exposure to EV technology remained relatively limited despite the respondents' generally favourable socioeconomic profile.

The demographic characteristics suggest that the respondents represented an economically active and relatively affluent urban consumer segment. This group is relevant to the study because it is more likely to possess the financial capacity and mobility requirements associated with vehicle purchasing decisions.

4.2 Descriptive Statistics

The results indicate that respondents generally perceived charging infrastructure and environmental considerations positively. Nevertheless, the moderate score for EV adoption intention suggests that favourable perceptions did not necessarily translate into a strong willingness to purchase an EV.

Table 2
Descriptive Statistics of Study Constructs

Construct	Mean	Standard Deviation
Environmental awareness	3.85	0.76
Cost-effectiveness	3.71	0.74
Charging infrastructure	4.32	0.78
Social influence	3.21	0.85
EV adoption intention	3.25	0.88

4.3 Reliability Analysis

Cronbach's alpha was used to assess the internal consistency of the measurement scales. As shown in Table 3, all constructs exceeded the recommended threshold of 0.70. The values ranged from 0.764 for cost-effectiveness to 0.899 for EV adoption intention, indicating acceptable to strong reliability across all constructs.

Table 3
Reliability of Study Constructs

Construct	Number of Items	Cronbach's Alpha	Interpretation
EV adoption intention	6	0.899	Good
Environmental awareness	6	0.842	Good
Cost-effectiveness	6	0.764	Acceptable
Charging infrastructure	4	0.889	Good
Social influence	6	0.872	Good

These findings confirm that the measurement items demonstrated satisfactory internal consistency and were suitable for subsequent correlation and regression analyses.

4.4 Correlation Analysis

Pearson correlation analysis was conducted to examine the relationships between the independent variables and EV adoption intention. All four independent variables were positively and significantly correlated with adoption intention at the 0.01 level.

Table 4
Pearson Correlations among Study Variables

Variable	EV Adoption Intention	Environmental Awareness	Cost-Effectiveness	Social Influence	Charging Infrastructure
EV adoption intention	1.000				
Environmental awareness	0.394**	1.000			
Cost-effectiveness	0.675**	0.535**	1.000		
Social influence	0.572**	0.365**	0.523**	1.000	
Charging infrastructure	0.245**	0.612**	0.588**	0.320**	1.000

Note: **p < 0.01, two-tailed.

Cost-effectiveness had the strongest correlation with EV adoption intention (r = 0.675), followed by social influence (r = 0.572) and environmental awareness (r = 0.394). Charging infrastructure demonstrated the weakest, although still significant, relationship with adoption intention (r = 0.245).

4.5 Regression Assumptions

Before conducting multiple regression analysis, the assumptions of normality and multicollinearity were assessed. The Normal P–P Plot showed that the standardised residuals were distributed close to the diagonal reference line, suggesting that the residuals were approximately normally distributed.

Multicollinearity was assessed using tolerance statistics. The reported tolerance values ranged from 0.504 to 0.715, indicating that no serious multicollinearity problem existed among the independent variables.

4.6 Multiple Regression Analysis

Multiple linear regression was conducted to determine the influence of environmental awareness, cost-effectiveness, charging infrastructure and social influence on EV adoption intention.

The model recorded an R value of 0.755 and an R^2 value of 0.569. This indicates that the four predictors collectively explained 56.9% of the variance in EV adoption intention. The adjusted R^2 value of 0.556 further suggests that the model retained substantial explanatory power after accounting for the number of predictors.

Table 5

Regression Model Summary

R	R^2	Adjusted R^2	Standard Error of Estimate
0.755	0.569	0.556	0.58847

The ANOVA results confirmed that the regression model was statistically significant, $F = 43.291$, $p < 0.001$. This indicates that the independent variables jointly provided a significant prediction of EV adoption intention.

Table 6

Regression Coefficients and Hypothesis Testing

Predictor	Standardised Beta	p-value	Direction	Hypothesis Decision
Environmental awareness	0.131	0.087	Positive	Not supported
Cost-effectiveness	0.629	<0.001	Positive	Supported
Charging infrastructure	-0.299	<0.001	Negative	Not supported
Social influence	0.290	<0.001	Positive	Supported

Cost-effectiveness emerged as the strongest positive predictor of EV adoption intention ($\beta = 0.629$, $p < 0.001$), followed by social influence ($\beta = 0.290$, $p < 0.001$). Environmental awareness had a positive but statistically insignificant effect ($\beta = 0.131$, $p = 0.087$). Charging infrastructure had a significant negative effect on adoption intention ($\beta = -0.299$, $p < 0.001$), contrary to the hypothesised positive relationship.

The regression equation may therefore be expressed conceptually as:

EV Adoption Intention = Cost-Effectiveness + Social Influence − Charging Infrastructure + Environmental Awareness

The findings support H2 and H4, while H1 and H3 are not supported.

4.7 Summary of Findings

The results demonstrate that economic and social considerations were more influential than environmental considerations in explaining EV adoption intention. Cost-effectiveness was the strongest predictor, showing that consumers placed substantial emphasis on long-term financial value. Social influence also contributed significantly, indicating that encouragement and approval from important social groups affected adoption intention.

Environmental awareness did not have a statistically significant effect after the other predictors were considered. Charging infrastructure produced an unexpected negative coefficient despite having a positive bivariate correlation with adoption intention. This contradictory finding requires

further interpretation in the discussion section, particularly in relation to charger reliability, accessibility and the possible overlap between infrastructure perceptions and other predictors.

5. Discussion

5.1 Cost-Effectiveness and EV Adoption Intention

Cost-effectiveness emerged as the strongest predictor of EV adoption intention, with a positive and significant effect. This finding indicates that consumers in Klang Valley place substantial importance on the long-term financial value of EV ownership, including lower energy expenditure, reduced maintenance requirements and potential savings over the vehicle's lifecycle.

The result is consistent with earlier Malaysian evidence showing that financial benefits significantly influence consumers' intention to use EVs [11]. It also supports more recent research highlighting the importance of performance expectancy, which includes perceived cost savings and functional benefits, in shaping EV adoption in Malaysia [6].

However, recent Malaysian findings also suggest that purchase price alone may not always be a significant barrier when consumers consider government incentives, subsidies and expected long-term savings [7]. The present study therefore suggests that consumers evaluate EV affordability through a broader cost-effectiveness perspective rather than focusing solely on the initial purchase price. This supports the DOI concept of relative advantage, whereby consumers are more likely to adopt an innovation when it is perceived to offer superior economic value compared with existing alternatives.

5.2 Social Influence and EV Adoption Intention

Social influence had a significant positive effect on EV adoption intention. This supports the Theory of Planned Behaviour, which proposes that behavioural intention is partly shaped by subjective norms and the perceived expectations of important social groups.

The finding suggests that recommendations from family members, friends, colleagues and existing EV owners may reduce uncertainty regarding EV performance, charging convenience and ownership costs. This is consistent with earlier Malaysian research that identified social influence as a significant predictor of EV usage intention [11].

Nevertheless, the descriptive mean for social influence was comparatively low. This suggests that although social influence is statistically important, EV ownership may not yet be sufficiently visible or widespread to create strong normative pressure. Recent Malaysian research similarly found that social and emotional values may have limited direct influence when practical and infrastructure-related concerns remain unresolved.

Thus, social influence may become stronger as more consumers gain direct exposure to EVs and as positive ownership experiences are shared through interpersonal networks, online reviews and community-based campaigns.

5.3 Charging Infrastructure and EV Adoption Intention

Charging infrastructure produced the most unexpected result. Although it was positively correlated with EV adoption intention, its regression coefficient was negative and statistically significant when the other predictors were controlled.

This finding should not be interpreted as evidence that more charging infrastructure discourages EV adoption. Instead, it may indicate that respondents who are more aware of charging infrastructure are also more conscious of its weaknesses, including uneven distribution, charger reliability, waiting time, accessibility, compatibility and payment inconvenience. Malaysian studies continue to identify limited charging availability and accessibility as major barriers to widespread adoption [7,17].

A recent study involving Malaysian drivers similarly reported that infrastructure-related barriers, particularly inadequate charging stations and maintenance services, were among the most significant constraints on EV adoption. This supports the argument that consumers evaluate infrastructure based not only on the number of charging stations but also on whether the network is dependable and convenient for everyday use.

Statistically, the change from a positive correlation to a negative regression coefficient may also indicate overlap among the independent variables or a possible suppression effect. Charging infrastructure was moderately correlated with environmental awareness and cost-effectiveness, which may have altered its unique contribution in the regression model. This interpretation should be presented cautiously and verified in future studies using additional diagnostics.

5.4 Environmental Awareness and EV Adoption Intention

Environmental awareness showed a positive but statistically insignificant effect on EV adoption intention. This suggests that respondents may recognise the environmental benefits of EVs without necessarily translating those beliefs into a willingness to purchase one.

This finding reflects the commonly observed attitude–behaviour gap in sustainable consumption. Consumers may support cleaner transportation in principle but continue to prioritise affordability, convenience, product reliability and charging accessibility when making a high-value purchasing decision. Recent Malaysian evidence also shows that practical and infrastructural considerations may outweigh social or environmental values in EV purchase decisions.

The result does not imply that environmental awareness is irrelevant. Instead, it may operate indirectly by shaping favourable attitudes or strengthening the influence of other adoption factors. Awareness campaigns that focus only on emissions reduction may therefore be less effective than campaigns that combine environmental benefits with financial savings, convenience and practical ownership information.

5.5 Theoretical Implications

The findings provide partial support for the integrated TPB–DOI framework. Social influence supports the subjective norm component of TPB, while cost-effectiveness reflects the relative advantage dimension of DOI. These two factors significantly explained EV adoption intention.

In contrast, environmental awareness did not directly influence adoption intention, suggesting that favourable environmental attitudes alone may be insufficient to motivate a major purchasing decision. The unexpected infrastructure result further indicates that compatibility and practical usability should be measured in terms of service quality, reliability and user experience rather than the general visibility of charging stations.

The study therefore shows that EV adoption in an emerging urban market is driven more strongly by perceived economic value and social reassurance than by environmental concern alone.

5.6 Practical and Policy Implications

The findings offer several implications for policymakers, automotive manufacturers and charging point operators.

First, EV promotion should emphasise total cost of ownership rather than only purchase price. Consumers should be provided with transparent comparisons of energy costs, maintenance expenditure, financing, warranties and long-term savings relative to conventional vehicles.

Second, automotive firms should increase experiential exposure through test-drive programmes, workplace demonstrations, owner referral schemes and community EV events. Such initiatives may strengthen social proof and reduce uncertainty among consumers who have limited direct experience with EVs.

Third, charging infrastructure strategies should prioritise reliability and usability in addition to network expansion. Charging point operators should improve charger uptime, payment integration, real-time availability information, maintenance response and coverage along frequently travelled routes.

Finally, environmental communication should be linked with practical consumer benefits. Messages combining lower emissions with cost savings, convenience and ownership reliability are likely to be more persuasive than general environmental appeals alone. These priorities are consistent with recent Malaysian studies recommending integrated investment in infrastructure, financial incentives and public awareness to accelerate EV adoption.

6. Conclusion

6.1 Conclusion

This study examined the influence of environmental awareness, cost-effectiveness, charging infrastructure and social influence on consumers' intention to adopt electric vehicles in Klang Valley, Malaysia. Using an integrated framework based on the Theory of Planned Behaviour and Diffusion of Innovation theory, the study provides a broader explanation of EV adoption by considering behavioural, social, economic and infrastructural factors simultaneously.

The findings show that cost-effectiveness was the strongest positive predictor of EV adoption intention, followed by social influence. This indicates that potential consumers place considerable emphasis on the long-term financial value of EV ownership and on reassurance from family members, peers and existing users. Environmental awareness, although positively related to adoption intention, was not statistically significant when the other variables were considered. This suggests that environmental concern alone may not be sufficient to motivate a high-value vehicle purchase. Charging infrastructure produced a significant negative coefficient despite having a positive bivariate relationship with adoption intention, indicating that consumers may remain concerned about charger reliability, accessibility and practical usability.

Overall, the study demonstrates that EV adoption in Klang Valley is influenced more strongly by perceived economic value and social confidence than by environmental concern alone. The findings also suggest that infrastructure development should not be assessed only through the number of charging points, but also through service quality, interoperability, accessibility and user experience.

6.2 Contributions of the Study

The study contributes theoretically by integrating TPB and DOI perspectives within a single empirical model. Social influence reflects the normative component of TPB, while cost-effectiveness and charging infrastructure represent the perceived relative advantage and practical compatibility of EV technology. The results show that combining these perspectives provides a useful explanation of EV adoption intention in an emerging urban market.

Practically, the findings offer guidance to policymakers, automotive manufacturers and charging point operators. EV promotion strategies should communicate total cost of ownership, long-term savings and maintenance advantages more clearly. Automotive firms should also increase consumer exposure through test-drive programmes, owner referral campaigns and community engagement. At the same time, infrastructure providers should prioritise charger uptime, integrated payment systems, real-time availability information and convenient geographical coverage.

6.3 Limitations

Several limitations should be acknowledged. First, the study used convenience sampling, which limits the generalisability of the findings to the wider Malaysian population. Second, the sample was restricted to Klang Valley and may not reflect consumer conditions in smaller cities, rural areas or regions with less-developed charging infrastructure. Third, the cross-sectional design captured consumer perceptions at one point in time and therefore cannot establish changes in adoption behaviour over time. Finally, the study measured behavioural intention rather than actual EV purchase behaviour.

6.4 Recommendations for Future Research

Future research should focus particularly on the two unexpected findings identified in this study. First, charging infrastructure was positively correlated with EV adoption intention but became a significant negative predictor when the other variables were controlled. This relationship warrants further investigation by separating infrastructure into more specific dimensions, such as charger availability, geographical accessibility, reliability, waiting time, interoperability, charging speed and payment convenience. Future studies should also examine whether the negative coefficient reflects a suppression effect or whether consumers with greater exposure to charging infrastructure become more aware of its operational limitations.

Second, environmental awareness was positively associated with adoption intention but did not exert a significant direct effect in the regression model. Future research could therefore examine whether environmental awareness influences EV adoption indirectly through attitudes, perceived value or cost-effectiveness rather than as a direct predictor. Mediation analysis would be particularly useful in testing this possibility.

Future studies could also compare Klang Valley with less-developed EV markets elsewhere in Malaysia. Such comparisons would help determine whether the importance and direction of charging infrastructure differ according to the maturity of the local EV ecosystem. Longitudinal research could further establish whether improvements in infrastructure quality and increasing direct exposure to EVs eventually translate into stronger adoption intentions and actual purchasing behaviour.

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Conflict of Interest Statement
The authors declare that there is no conflict of interest regarding the publication of this paper.

Author Contributions Statement
Abdul Khabir Rahmat contributed to the conceptualization, study design, interpretation, and manuscript preparation. Syed Jamal Abdul Nasir Syed Mohamad, Mohd Fazri bin Abd Latif, Abdul Rahman bin Saaban, and Mohamad Zafran bin Zainudin contributed to the study development, data-related work, interpretation, and manuscript review. All authors read and approved the final manuscript.

Data Availability Statement
The data supporting the findings of this study are available from the corresponding author upon reasonable request, subject to applicable institutional and ethical requirements.

Ethics Statement
Participation in the study was voluntary, respondents were informed of the study purpose, and no personally identifiable information was collected. The data were used solely for academic purposes.

References
[1] International Energy Agency. 2025. *Global EV Outlook 2025: Expanding Sales in Diverse Markets*. Paris: International Energy Agency.
[2] Malaysian Investment Development Authority. 2021. "Enhanced Investment Incentives to Drive Malaysia's Automotive Industry into the Future."
[3] Malaysian Green Technology and Climate Change Corporation. 2025. "Development and Expansion of Malaysia's Electric-Vehicle Charging Network."
[4] Yusoff, S. H. M., N. H. Karim, S. Abd Latif, H. Hashim, Y. A. Abdul Wahab, Z. Ayop, A. Ariffin, C. M. Mohd Kasim, and S. Z. Syed Abdul Jalil. 2023. "A Study of Consumer Attitudes and Factors Affecting Electric Vehicles Adoption." *Selangor Science & Technology Review*.
[5] Asadi, S., M. Nilashi, S. Samad, R. Abdullah, M. Mahmoud, M. H. Alkinani, and E. Yadegaridehkordi. 2021. "Factors Impacting Consumers' Intention toward Adoption of Electric Vehicles in Malaysia." *Journal of Cleaner Production* 282: 124474. https://doi.org/10.1016/j.jclepro.2020.124474.
[6] Abdul Rahman, M. S., A. Ibrahim, and Z. Ismail. 2024. "Accelerating EV Adoption in Malaysia: Performance and Effort Expectancy as Key Drivers." *Social and Management Research Journal* 21 (2): 193–203. https://doi.org/10.24191/smrj.v21i2.4454.
[7] Syed Mansor, S. M. F., and H. S. Anuar. 2025. "Price Perception, Charging Infrastructure and Environmental Consciousness That Influence Adoption of Electric Vehicle: Malaysia Perspectives." *Journal of Technology and Operations Management* 20 (2): 21–37. https://doi.org/10.32890/jtom2025.20.2.2.
[8] Ajzen, I. 1991. "The Theory of Planned Behavior." *Organizational Behavior and Human Decision Processes* 50 (2): 179–211. https://doi.org/10.1016/0749-5978(91)90020-T.
[9] Thwe, S. M., W. M. Lim, K. Y. Koay, and D. Ong. 2025. "Consumers' Motivation to Purchase Electric Vehicles: A Mixed-Methods Belief Elicitation Study Using Theory of Planned Behavior." *Acta Psychologica* 258: 105185. https://doi.org/10.1016/j.actpsy.2025.105185.
[10] Rogers, E. M. 2003. *Diffusion of Innovations*. 5th ed. New York: Free Press.
[11] Sang, Y. N., and H. A. Bekhet. 2015. "Modelling Electric Vehicle Usage Intentions: An Empirical Study in Malaysia." *Journal of Cleaner Production* 92: 75–83. https://doi.org/10.1016/j.jclepro.2014.12.045.

[12] Pandita, D., V. Bhatt, V. V. Ravi Kumar, A. Fatma, and F. Vapiwala. 2024. "Electrifying the Future: Analysing the Determinants of Electric Vehicle Adoption." *International Journal of Energy Sector Management* 18 (6): 1767–1786. https://doi.org/10.1108/IJESM-06-2023-0004.

[13] Creswell, J. W., and J. D. Creswell. 2018. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. 5th ed. Los Angeles: SAGE.

[14] Sekaran, U., and R. Bougie. 2016. *Research Methods for Business: A Skill-Building Approach*. 7th ed. Chichester: Wiley.

[15] Hair, J. F., W. C. Black, B. J. Babin, and R. E. Anderson. 2019. *Multivariate Data Analysis*. 8th ed. Andover: Cengage.

[16] Tavakol, M., and R. Dennick. 2011. "Making Sense of Cronbach's Alpha." *International Journal of Medical Education* 2: 53–55. https://doi.org/10.5116/ijme.4dfb.8dfd.

[17] Umair, M., N. M. Hidayat, N. H. Nik Ali, N. S. M. Nasir, T. Hakomori, and E. Abdullah. 2024. "A Review of Malaysia's Current State and Future in Electric Vehicles." *Journal of Sustainable Development of Energy, Water and Environment Systems* 12 (4): 1120522. https://doi.org/10.13044/j.sdewes.d12.0522.