# Exploring Electric Vehicle Intention Among Malaysian Car Users: Insights from an Integrated TPB– UTAUT Model

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## ABSTRACT

Electric vehicles (EVs) are widely recognized as a vital pathway to sustainable mobility, yet their adoption remains limited in many emerging markets, including Malaysia. Despite the presence of policy incentives under the National Automotive Policy (NAP 2020/2030), consumer uptake is hampered by affordability concerns, infrastructural constraints, and distinct social and cultural factors. This study investigates the determinants of Malaysian car users' intention to adopt EVs through an integrated framework combining the Theory of Planned Behavior (TPB) and the Unified Theory of Acceptance and Use of Technology (UTAUT). Utilizing a cross-sectional survey of 50 respondents, the study assessed attitude (ATT), social influence (SI), facilitating conditions (FC), and intention to adopt EVs (IEV), employing a five-point Likert scale. Reliability analysis established strong internal consistency across constructs. Regression analyses revealed that both attitude and social influence emerged as significant predictors of EV adoption intention, whereas facilitating conditions did not reach statistical significance. The study's theoretical contribution lies in extending the integrated TPB–UTAUT framework to the Malaysian EV market, highlighting the salient interplay of individual attitudes and peer influence while exposing persistent infrastructural and policy readiness gaps. Practically, the findings inform policymakers and industry stakeholders by providing targeted recommendations to accelerate mainstream EV adoption in Malaysia.

**Keywords:** Electric vehicles; Intention; Theory of Planned Behaviour; UTAUT; Malaysia; Social influence

## INTRODUCTION

The global automotive sector is undergoing a transformative shift with the rise of electric vehicles (EVs) as a cornerstone of sustainable mobility. In 2023, global EV sales surpassed 14 million units, representing nearly 18% of total new car sales (IEA, 2025). Projections indicate that by 2030, EVs could account for more than 60% of global passenger car sales, driven by technological advancements, cost reductions, and policy mandates (Bloomberg NEF, 2025). Despite these global gains, EV adoption in many emerging markets remains limited. In Malaysia, the EV market share stood at below 2% of new vehicle sales in 2024 (Malaysian Automotive Association, 2024), reflecting persistent barriers such as high upfront costs, limited charging infrastructure, and consumer uncertainty. Malaysia's government has introduced multiple policy initiatives to stimulate EV adoption. The National Automotive Policy (NAP 2020/2030) emphasizes electrification, aiming to position Malaysia as a regional EV hub by 2030. Key incentives include import duty exemptions, tax reductions, and investment in public charging stations (Ministry of Investment, Trade and Industry, 2022). However, despite these efforts, uptake has been slow, suggesting that financial incentives and infrastructure improvements alone

may be insufficient to achieve the desired results. Consumer-level psychological and social factors such as perceptions of EVs, trust in government initiatives, and peer influence require deeper exploration to complement policy design.

Theoretically, this study draws on the Theory of Planned Behaviour (TPB) (Ajzen, 1991) and the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003). TPB posits that intention, the primary predictor of behaviour, is shaped by attitude (ATT), subjective norms (SI), and perceived behavioural control. UTAUT complements this by emphasizing social influence (SI) and facilitating conditions (FC). Prior studies across developed markets highlight that both attitudes and infrastructural readiness strongly predict EV adoption (Rezvani et al., 2015). However, in Malaysia, most research has emphasized adoption behaviour rather than intention formation (Sang & Bekhet, 2015), and few have integrated TPB and UTAUT within the same empirical framework. Moreover, consumer hesitancy in Malaysia extends beyond affordability. Studies highlight low trust in government incentives, uncertainty about technological reliability, and fear of insufficient charging availability as significant deterrents.These factors raise critical questions about how attitudes, peer influence, and infrastructural perceptions shape intention to choose EVs. Against this backdrop, this study addresses two research gaps. First, it examines intention rather than adoption, acknowledging that intention serves as a precursor to behaviour in markets where EV uptake is still nascent. Second, it integrates TPB and UTAUT to provide a more holistic understanding of intention drivers, particularly within the Malaysian socio-cultural and policy context. The findings offer both theoretical contributions, extending TPB and UTAUT validation into an ASEAN context, and practical insights that inform policy and marketing strategies aligned with NAP 2030 objectives.

## LITERATURE REVIEW

### Theoretical Foundations: TPB and UTAUT in EV Intention Research

The Theory of Planned Behaviour (TPB) posits that behavioural intention is driven by attitude (ATT), subjective norms, and perceived behavioural control. The Unified Theory of Acceptance and Use of Technology (UTAUT) and its extensions emphasize social influence (SI) and facilitating conditions (FC) as key predictors of intention and usage. Integrating TPB and UTAUT often improves the explanatory power in mobility studies by capturing both psychological evaluations (ATT) and structural enablers (FC), while SI reflects culturally embedded decision-making processes. This integration is particularly informative in emerging markets, where policy signals and infrastructure evolve in tandem with shifting social norms. Recent ASEAN-focused studies highlight that ATT and SI often dominate intention at early market stages, while the effect of FC strengthens as charging networks and incentives reach critical mass (Brinkmann et al., 2023; Samarasinghe et al., 2024).

### Attitude Toward EVs (ATT)

Attitude, defined as consumers' favourable evaluation of EVs' modernity, performance, environmental benefit, and cost profile, consistently predicts intention. A Malaysia-focused study modelling EV purchase intention among Generation Y showed that positive appraisals and perceived usefulness materially increase intention, underscoring ATT's primacy in early diffusion phases (Vafaei-Zadeh et al., 2022). In the broader

ASEAN region, the same pattern is evident; studies in Thailand and Indonesia find ATT to be a direct and sizable predictor of intention, often outweighing purely economic variables when cost-of-ownership narratives are credible and visible (Hakam et al., 2024; Phuthong et al., 2024).

### Social Influence (SI) in Collectivist Settings

Social influence, which encompasses approval from family, peers, and salient reference groups, holds greater salience in collectivist cultures, where purchase decisions are deeply embedded in the social context. ASEAN evidence suggests that peer learning and community signalling can catalyse intention, even when infrastructure is still in the development stage. For instance, research in Thailand reveals that community norms and the visibility of early adopters significantly influence the intentions of young consumers (Brinkmann et al., 2023). Similar dynamics are reported across ASEAN syntheses. In Malaysia, where family consultation and community standing are common in large purchases, SI is expected to be a robust predictor and an actionable lever for

campaigns (Chenayah et al., 2024).

### Facilitating Conditions (FC): Infrastructure, Incentives, and the Perception Gap

Facilitating conditions capture the availability and accessibility of charging infrastructure, the clarity of incentives, and broader institutional support. In mature EV markets, FC has a strong, direct effect on intention and adoption. However, in ASEAN contexts, FC can appear statistically weaker if consumers perceive coverage as urban-centric or incentives as complex (Umair et al., 2024). Recent evidence from Malaysia documents persistent challenges, including inadequate charging density, uneven geographic distribution, and affordability concerns, which can diminish the measured effect of FC, even when respondents rate FC as important. This points to a perception–reality gap: FC matters, but insufficient scale or visibility blunts its predictive power at the intention stage.

### Environmental Concern as an Attitudinal Antecedent

Environmental concern, awareness, and prioritization of environmental quality often enhance ATT and, indirectly, intention. ASEAN syntheses note that pro-environmental orientations correlate with higher EV preference, though budget constraints and range or charging anxiety can moderate this link. Including environmental concern upstream of ATT, rather than as a parallel predictor, typically improves theoretical parsimony in intention models for emerging markets (Zhu et al., 2024).

### Trust in Technology and Policy

Trust in vehicle technology, batteries, safety, after-sales support, and the consistency and accessibility of government incentives are increasingly recognized as key determinants of intention in emerging markets. Malaysian and ASEAN reviews highlight uncertainty about long-term reliability, resale value, and policy continuity as barriers that may dampen both FC and ATT simultaneously (Umair et al., 2024). Incorporating trust as a distinct construct or as a moderator of ATT and FC has been recommended in recent regional analyses to capture this credence-good dimension of EVs.

### Perceived Ease of Use (PEOU) and Effort Expectancy

Although more commonly associated with the Technology Acceptance Model (TAM) and UTAUT2, perceived ease of use or effort expectancy, the belief that EV use and charging are straightforward, is relevant to intention via improved ATT and reduced perceived risk. ASEAN studies report that first-hand

exposure, such as test drives and public charging demos, can increase PEOU and normalize routines like home or office charging, thereby indirectly raising intention. As user familiarity grows, the indirect effects of PEOU (via ATT) become more visible in structural models (Samarasinghe et al., 2024).

## METHOD

### Research Design

This study employed a quantitative, cross-sectional survey design to examine the determinants of Malaysian consumers' intention to choose electric vehicles (EVs). A structured questionnaire was developed based on established scales from TPB (Ajzen, 1991) and UTAUT (Venkatesh et al., 2003). The constructs included attitude (ATT), social influence (SI), facilitating conditions (FC), and the dependent variable (intention to choose EVs, IEV). Each item was measured on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

### Sampling and Data Collection

Respondents were required to be licensed Malaysian drivers who owned or regularly used a car. A purposive-convenience sampling strategy was applied due to practical constraints of time, cost, and accessibility. A total of 50 valid responses were collected between April and May 2025. Although the sample size is modest, it aligns

with exploratory precedent in behavioural intention research, where pilot studies often use 30–50 participants to establish preliminary evidence (Hair et al., 2019). To strengthen methodological rigor, this limitation is explicitly acknowledged, and results are interpreted as indicative rather than generalizable.

### Questionnaire Structure

The questionnaire consisted of three sections. A pre-screening question about car ownership and driving license validity: a demographic profile consisted of gender, age, race, and monthly income. The four-item measurement of attitude (ATT) was adapted from Ajzen (1991), and the five-item measurement of social influence was adapted from Venkatesh et al. (2003). Meanwhile, the five items of facilitating conditions covered infrastructure and policy support. Finally, four items of intention to choose (IEV) adoption were from Rezvani et al. (2015). Data were analysed using SPSS 28.0. Descriptive statistics were generated to profile respondents and summarize construct means. Reliability and validity analyses were performed as outlined above. Multiple regression analysis was then employed to test the hypotheses, with ATT, SI, and FC as predictors of IEV. Assumption tests, including normality, homoscedasticity, and multicollinearity (Variance Inflation Factor, VIF < 3), confirmed the robustness of the regression results. A total of 50 valid responses were analysed. The sample was balanced by gender (52% male, 48% female), with the majority aged 23–40 years (72%). Most respondents were from the middle-income group (RM 3,000–6,000 per month, 58%), while Malays formed the majority of the ethnic group (66%), followed by Chinese, Indians, and others. This profile reflects Malaysia's primary car-buying demographic.

## RESULTS AND DISCUSSION

### Reliability and Validity

Reliability and validity tests confirmed that all constructs were robust, as shown in Table 1. Cronbach's alpha values ranged from 0.78 to 0.94. AVE values exceeded 0.50, and CR values were above 0.70, confirming convergent validity and composite reliability.

**Table 1.** Reliability and Validity Results

| Construct | Items | Cronbach's α | Interpretation |
|---|---|---|---|
| Attitude (ATT) | 4 | 0.82 | Good |
| Social Influence (SI) | 5 | 0.91 | Excellent |
| Facilitating Conditions (FC) | 5 | 0.78 | Acceptable |
| Intention to Choose EV (IEV) | 4 | 0.94 | Excellent |

### Descriptive Statistics

The descriptive results indicate that respondents generally exhibited favourable perceptions toward electric vehicles (EVs) across the examined constructs. Attitude obtained the highest mean score (M = 3.9, SD = 0.6), indicating a strong agreement that EVs are modern, environmentally sustainable, and represent a significant advancement toward future mobility solutions. Social influence ranked second (M = 3.7, SD = 0.7), indicating that familial expectations, peer norms, and societal pressures had a moderate influence on respondents' behavioural alignment toward EV adoption. The intention construct recorded a mean of 3.6 (SD = 0.7), demonstrating a measured yet positive inclination among participants to consider or adopt EVs, although accompanied by some degree of reservation. Conversely, facilitating conditions yielded the lowest mean score (M = 3.5, SD = 0.8), indicating that concerns over the adequacy of charging infrastructure, policy incentives, and overall accessibility remain prevailing barriers.

### Regression Analysis

A multiple regression analysis was conducted to examine the influence of attitude, social influence, and facilitating conditions on the intention to adopt electric vehicles (EVs). Before interpreting the results, the

assumptions of regression analysis were assessed and found to be meet satisfactorily. The residuals were normally distributed, as indicated by the Kolmogorov–Smirnov test ($p > 0.05$), suggesting no violation of normality. The scatterplot of standardized residuals further confirmed homoscedasticity, showing consistent variance across predicted values. Additionally, variance inflation factor (VIF) values for all predictors were below 3, indicating the absence of serious multicollinearity concerns. The multiple regression analysis was conducted to examine the influence of attitude, social influence, and facilitating conditions on the intention to adopt electric vehicles (EVs). Table 2 presents the model's results, which demonstrate strong explanatory power with an $R^2$ value of 0.62 ($p < 0.001$), indicating that 62% of the variance in intention is explained by the three predictors ( Kraisame, Butler & Pitakaso, 2023). Among these, attitude ($\beta = 0.41$, SE = 0.13, $t = 3.22$, $p = 0.003$) emerged as the most influential and statistically significant predictor, underscoring the central role of favourable personal evaluations and perceptions in shaping EV adoption intention. Similarly, social influence ($\beta = 0.38$, SE = 0.14, $t = 2.78$, $p = 0.009$) was found to have a significant positive effect, highlighting the importance of normative pressure and social endorsement in motivating behavioural intention. Conversely, facilitating conditions ($\beta = 0.19$, SE = 0.11, $t = 1.82$, $p = 0.072$) did not achieve statistical significance, suggesting that while infrastructural and policy-related support factors are relevant, they may not yet constitute a decisive determinant in respondents' EV adoption decisions. Overall, the results indicate that individual attitudes and social influences play dominant roles, whereas external enabling conditions still require enhancement to strengthen consumers' behavioural commitment toward EV adoption.

**Table 2.** Regression Results

| Predictor | Beta (β) | SE | t | p-value | Result |
|---|---|---|---|---|---|
| Attitude (ATT) | 0.41 | 0.13 | 3.22 | 0.003 | Significant |
| Social Influence (SI) | 0.38 | 0.14 | 2.78 | 0.009 | Significant |
| Facilitating Conditions (FC) | 0.19 | 0.11 | 1.82 | 0.072 | Not Significant |
| Model $R^2$ | 0.62 | – | – | <0.001 | Strong Fit |

## DISCUSSION

The present study, integrating the Theory of Planned Behavior (TPB) and the Unified Theory of Acceptance and Use of Technology (UTAUT), investigated the determinants of Malaysian consumers' intention to adopt electric vehicles (EVs). Regression results revealed that attitude and social influence were statistically significant predictors of adoption intention, whereas facilitating conditions, despite yielding positive mean scores, did not achieve statistical significance. The model's explanatory power ($R^2 = 0.62$, $p < 0.001$) surpasses comparable ASEAN findings, with Indonesia and Thailand reporting 58% and 60% variance explanation, respectively (Kraisame, Butler & Mehnen, 2023), underscoring that EV readiness in Malaysia is driven more by psychological and normative elements than infrastructural enablers. Attitude emerged as the most dominant factor ($\beta = 0.41$, $p = 0.003$), confirming that favourable perceptions of EVs as eco-friendly, technologically advanced, and cost-efficient significantly elevate adoption intention, consistent with global literature (Rezvani et al., 2015). Social influence ($\beta = 0.38$, $p = 0.009$) further reinforced this behavioural orientation, reflecting Malaysia's collectivist cultural context, where familial and community endorsements carry substantial weight. This suggests that community-based marketing strategies and peer-driven testimonials may yield a greater impact than individualistic approaches. The non-significance of facilitating conditions ($\beta = 0.19$, $p = 0.072$), despite a moderate mean score ($M = 3.5$), can be attributed to measurement limitations—where respondents equated FC primarily with charging infrastructure rather than broader policy and financial supports—and to a perceptual gap driven by uneven infrastructure distribution, predominantly concentrated in urban hubs. This pattern contrasts sharply with mature EV markets, such as Norway, where FC strongly predicts adoption (Figenbaum & Kolbenstvedt, 2016), suggesting that Malaysia's infrastructure and policy environment have yet to reach a critical threshold. Socioeconomic realities further contextualize these findings, with a middle-income-dominated sample (RM 3,000–6,000) being price-sensitive, an urban–rural divide limiting equitable access, and historical inconsistencies in incentives eroding policy trust. Comparatively, Malaysia's drivers of EV intention mirror structural trends in ASEAN markets, where attitudes and social norms outweigh infrastructural factors in

early adoption stages, but diverge from Western and Chinese contexts, where policy maturity and infrastructure completeness elevate FC's predictive influence.

**Implications**

The findings of this study offer several theoretical and practical implications. First, they validate the integration of the Theory of Planned Behaviour (TPB) and the Unified Theory of Acceptance and Use of Technology (UTAUT) in the context of emerging markets, demonstrating that attitude and social influence operate as robust and consistent predictors of behavioural intention toward EV adoption. This integration not only reinforces the applicability of these models beyond developed economies but also highlights their complementarity in explaining consumer decision-making. Second, the relatively weak influence of facilitating conditions suggests that its predictive capacity is contingent upon the maturity of the supporting ecosystem, including infrastructure, policy frameworks, and accessibility. This underscores the importance for policymakers and industry actors to prioritise ecosystem development before expecting substantial behavioural shifts. Third, from a theoretical standpoint, the results suggest the potential refinement of the TPB–UTAUT framework by examining facilitating conditions as a moderating variable, rather than a direct predictor, in future research designs. Finally, the pronounced effect of social influence underscores the importance of cultural contextualization, particularly in collectivist societies like Malaysia, where communal norms and peer endorsement can significantly influence behavioural outcomes. This insight calls for culturally attuned strategies in both academic modelling and practical marketing interventions**.**

The study yields several practical implications for advancing electric vehicle (EV) adoption in Malaysia. Given that attitudes are the strongest predictor of intention, campaigns should prioritize messaging that highlights the modernity, technological innovation, and environmental benefits of EVs, as well as the long- term cost savings from reduced fuel and maintenance costs. Coordinated national campaigns can leverage early adopters' testimonials, collaborate with universities and NGOs to educate young drivers, and utilize media to link EV adoption to climate goals and national pride, thereby positioning EVs as integral to Malaysia's sustainable future. Recognizing the significant influence of social norms, policymakers and marketers are encouraged to develop peer-driven strategies, such as community-based EV programs, influencer partnerships, and the establishment of peer ambassador networks, to disseminate experiential endorsements. These approaches will resonate well within Malaysia's collectivist sociocultural context, where family and societal endorsement play a pivotal role in shaping consumer preferences. Although facilitating conditions were not statistically significant in the regression model, the overall positive perception underscores the need to address existing perception gaps by expanding charging infrastructure, especially in rural regions; streamlining and increasing transparency of financial incentives; promoting green financing schemes with government guarantees; and fostering partnerships with private sector stakeholders to broaden charging networks. Finally, targeted policies and automotive strategies should cater to middle-income households, who represent the largest segment of prospective adopters, by designing accessible financing options, introducing trade-in and subscription programs, and reducing overall adoption costs. Together, these recommendations offer actionable pathways to bridge Malaysia's readiness gap and accelerate mainstream EV uptake.

## CONCLUSION

Despite the valuable contributions of this study, several limitations warrant consideration. The relatively small sample size (n = 50) limits the extent to which findings can be generalized across Malaysia's diverse consumer population. The use of convenience sampling introduces potential biases, as it may not fully capture the demographic and attitudinal heterogeneity present nationwide. Furthermore, the cross-sectional research design restricts the ability to draw definitive causal inferences regarding the relationships among constructs. Additionally, the scope of analysis was confined to three primary predictors, thereby excluding other potentially relevant factors such as environmental concern, trust in policy, and perceived ease of use, all of which may play significant roles in shaping EV adoption intentions. Addressing these limitations, future research should endeavour to expand sample sizes and ensure robust regional representation, including participants from East Malaysia and rural communities. Incorporating a broader set of constructs, such as environmental concern, trust in technology, and ease of use, would offer a more holistic perspective. Methodologically, the application of advanced analytical techniques, such as structural equation modelling (SEM), partial least squares (PLS), and

multi-group analyses, could elucidate underlying mediation and moderation effects. Lastly, longitudinal studies are recommended to capture the evolution of consumer perceptions and behavioural intentions as Malaysia's EV infrastructure continues to develop. Comparing Malaysia with other ASEAN countries to derive regionally relevant strategies. In conclusion, this study underscores that while attitude and social norms are powerful motivators for EV intention in Malaysia, the absence of strong facilitating conditions constrains consumer readiness. Bridging this gap requires coordinated action: shaping favourable perceptions, leveraging community influence, expanding equitable infrastructure, and targeting affordability. By aligning consumer intention with national policy objectives, Malaysia can accelerate EV adoption and strengthen its position as an emerging leader in sustainable mobility within ASEAN.

## RECOMMENDATIONS

Future research should employ larger and more stratified samples to capture Malaysia's demographic and geographic diversity, ensuring representation from both urban and rural regions. Expanding the sample base would strengthen the validity and generalizability of findings on electric vehicle (EV) intention across various consumer segments.

Theoretically, future studies could extend the TPB–UTAUT framework by incorporating constructs such as environmental concern, trust in government policy, and perceived ease of use**.** These additions would enrich the model's explanatory power and offer deeper insights into psychological, social, and policy-related drivers of EV intention. Methodologically, employing Structural Equation Modelling (SEM) or Partial Least Squares (PLS) is recommended to identify mediation and moderation effects, thus enhancing analytical depth and model precision. Collectively, these refinements would elevate both the academic and practical relevance of future EV intention research in Malaysia and the broader ASEAN context.

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