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Determinants of Electric Vehicle Adoption Intention: A Partial UTAUT2 Framework in an Emerging Economy

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Abstract

Expanding the use of electric vehicles (EVs) is now viewed as a vital component in establishing environmentally friendly transport frameworks. Despite technological advancements and policy support, the rate of adoption in developing countries continues to be relatively low. This research aims to investigate the elements influencing the choice to embrace EVs by utilizing the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2). Data were collected from 470 individuals in Bali, Indonesia, via a structured questionnaire. To evaluate the gathered data, the study employed Partial Least Squares Structural Equation Modeling (PLS-SEM) as the primary analytical tool. Research findings demonstrate that behavioral intentions toward EV ownership are substantially shaped by performance expectancy, effort expectancy, social influence, and price value. Of these factors, price value emerged as the most important predictor, trailed by effort expectancy, social influence, and performance expectancy. The model accounts for 34.4% of the variability in behavioral intention. These findings indicate that financial factors play a crucial role in influencing adoption intentions in emerging markets, while usability and social aspects offer further assistance. The study contributes to current understanding by indicating that a streamlined UTAUT2 framework can efficiently elucidate adoption behaviors related to high-involvement technologies. Practical implications highlight the need for financial rewards, available infrastructure, and approaches that utilize social influence to encourage the uptake of EVs.

Keywords: Adoption of Technology, Behavioral Intention, Electric Vehicle, Emerging Economy, Price Value, UTAUT2.

Introduction

As the world focuses more on sustainable transportation, electric vehicles (EVs) have become an important solution for lowering greenhouse gas emissions, using energy more efficiently, and decreasing dependence on fossil fuels (1). Governments and industry stakeholders around the world have been pushing for EVs more and more by offering policy incentives, developing new technologies, and building more infra-structure (2). Even with these efforts, the number of people who own EVs in many developing countries is still low. This shows that being ready for the technology is not enough to get a lot of people to use it (3). In emerging economies, adoption decisions are frequently influenced by technical accessibility, individual views, social factors, and economic assessments (4, 5). People who are thinking about getting an electric car usually take their time and think about the perceived benefits, how easy it is to operate, social influence, and economic worth before deciding to do so (6). Among these models, the UTAUT - 2 offers a detailed understanding of behavioral intentions by combining aspects of technology, society, and economy. Nevertheless, previous studies suggest that the different components of UTAUT2 do not hold the same significance across different technological features and socioeconomic environments (7). For high involvement and utilitarian technologies such as EVs, employing the full UTAUT2 model may introduce unnecessary complexity without substantially improving explanatory power (8). Numerous research efforts illustrate that a targeted use of essential UTAUT2 elements can successfully clarify the intention to adopt, especially in developing countries where

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various external and situational aspects significantly impact adoption patterns (9, 10).

Factors such as price value, performance expectancy, social influence, and effort expectancy are consistently identified as robust predictors of behavioral intention. In contrast, other variables often play a more prominent role in post-adoption phases or hedonic technology usage. Based on this logic, the current research utilizes a streamlined UTAUT2 model to analyze the drivers of EV adoption within an emerging market. Performance expectation, effort expectancy, social impact, and price value are among the most important factors influencing EV adoption intention, according to research done in nations like Thailand, India , Malaysia, and China. However, during the early phases of sustainable technology dissemination, some UTAUT2 constructs such as hedonic motivation and habit tend to show weaker explanatory relevance, especially in emerging economies where EV ownership is still relatively low. This study contributes by examining EV adoption intention in an emerging economy using a parsimonious UTAUT2 framework emphasizing economic, usability, and social determinants.

EV Adoption and Technology Acceptance

EV adoption has attracted growing scholarly attention due to its relevance to sustainability and energy transition goals (7). Earlier studies highlight that the intention to adopt is shaped by a mix of perceived advantages of technology, user-friendliness, societal influences, and financial factors, especially in developing economy settings where there is considerable uncertainty and sensitivity to prices (11, 12) . One such framework, the UTAUT2, enhances previous acceptance theories by including both practical and consumer-focused elements (13). UTAUT2 claims that various fundamental factors impact behavioral intention, such as performance expectations, effort expectations, social pressure, and perceived value of price. While the comprehensive UTAUT2 model features further constructs and moderators, recent findings indicate that focusing on its essential predictors is often more suitable for exploring the initial adoption of technologies with significant involvement.

Performance Expectancy (PE) and Behavioral Intention (BI)

Consumers tend to develop stronger intention to adopt EVs when they perceive that the technology can provide practical advantages, operational efficiency, and long-term mobility benefits (14, 15). Prior studies consistently identify performance expectancy as an important determinant of EV adoption intention. When individuals perceive that EVs offer superior functional advantages compared to conventional vehicles, their motivation to adopt such technology increases (16). Consequently, performance expectancy is projected to have a favorable impact on the intention to acquire EVs (17).

H_1: Performance expectation has a favorable impact on the intention to embrace EVs.

Effort Expectancy and Behavioral Intention

Potential adopters are generally more receptive toward EV technology when charging, operation, and maintenance are perceived as manageable and uncomplicated (18). In the context of EVs, effort expectation pertains to the views on the simplicity of their operation, the processes for charging, upkeep, and the general experience of the user (19). Previous studies indicate that technologies perceived as easy to use are more likely to be accepted, particularly during early adoption stages (20).

H_2: Effort expectancy positively influences behavioral intention to adopt EVs.

Social Influence (SI) and Behavioral Intention (BI)

Adoption decisions in collectivist societies are often shaped by peer experiences, family recommendations, and broader social acceptance toward emerging technologies (21). In the context of EVs, social influence may arise from increasing public discourse on environmental responsibility, peer endorsement, and visibility of electric usage within social networks (22). Previous studies suggest that positive social influence can strengthen EV adoption intention (23).

H_3: Social influence has a positive effect on the intention of individuals to adopt EVs.

Price Value (PV) and Behavioral Intention (BI)

Economic evaluation remains an important consideration in EV adoption because electric

vehicles generally involve higher upfront costs than conventional vehicles (24, 25). Existing research repeatedly emphasizes that price value continues to be a primary determinant of EV adoption, particularly within emerging economies characterized by higher price sensitivity. When potential adopters perceive EVs as economically advantageous in the long run, their intention to adopt the technology increases (7).

H_4: The price of an EV positively affects the likelihood of someone deciding to adopt it.

Methodology

Research Design

To investigate the variables influencing EV adoption intentions, this research adopted a quantitative, cross-sectional design. Primary data were gathered from people who want to adopt EVs using authorised survey method. The cross-sectional design is appropriate for analyzing behavioral intention at a specific point in time, particularly in emerging technology adoption contexts where market penetration is still evolving. The study uses a theory based method grounded in the partial UTAUT2 framework. The research framework focuses on four primary determinants (price value, performance expectancy, social influence, and effort expectancy) to evaluate their immediate influence on the intent to adopt electric vehicles.

Population and Sample

In this study, cluster sampling was employed to improve geographical representation across Bali. Respondents were recruited from several regencies including Denpasar (-8° 40' 0.012'' N and 115° 12' 59.868 E) , Badung (-8° 31' 0.012'' N and 115° 12' 0 E), Gianyar (-8° 28' 0.012'' N and 115° 16' 59.988 E), Tabanan (-8° 25' 59.988'' N and 115° 4' 0.012 E) and data was collected using a questionnaire. The sample size of 470 valid responses is adequate for PLS-SEM.This approach excels at examining complex relationships between latent constructs, especially when a completely normal data distribution is not required (26). This ensures the study has the statistical power needed for dependable hypothesis testing and parameter estimation. Voluntary participation was ensured, with all respondents fully briefed on the study's objectives prior to data collection. Furthermore, the research adhered to established social science ethical standards, maintaining strict data privacy and respondent confidentiality.

Measurement Instrument

The constructs were operationalized as follows:

a) Performance expectancy (PE): perceived functional and efficiency-related benefits of EVs
b) Effort expectancy (EE): perceived ease of learning and operating EVs
c) Social Influence (SI): The perceived encouragement or pressure from significant individuals to transition toward EV ownership
d) Price Value (PV): The cognitive trade-off between the functional advantages of an EV and its associated financial costs
e) Behavioral Intention: An individual's projected plan or readiness to purchase and utilize electric vehicles in the coming years.

A five point Likert scale, ranging from 'strongly disagree' to 'strongly agree', was used to measure each dimension. In behavioral research, this scaling strategy is considered a useful tool for obtaining subjective attitudes.

Method of Data Analysis

PLS- SEM was used for data analysis, chosen for its effectiveness in predictive modeling and its capacity to manage non-normal behavioral data (26) . There were two stages to the process: first, the measurement model (internal consistency, convergent validity, and indicator reliability) was validated, and then the structural model was assessed. A bootstrapping method with 5,000 resamples was used to produce t- statistics and p-values in order to assess the relevance of the path coefficients (β) and R^2 values.

Results

Descriptives Analysis

A total of 470 responses that were valid were used in the analysis. In terms of gender distribution, 56.38% of the participants were male, with a total of 265 individuals, whereas 43.62% were female, comprising 205 participants. This relatively balanced composition ensures adequate represent-tation across gender groups. In terms of age demographics, a significant portion of the participants fell within the economically active age group. Specifically, 33.62% were aged 21-30 years and 28.30% were 31-40 years, indicating that more than 60% of the sample belonged to economically active age groups. Respondents aged 41-50 years accounted for 19.79%, while those

under 20 and over 50 represented smaller proportions. This age composition suggests that most participants were at stages of life where vehicle ownership and mobility decisions are particularly relevant.

With respect to educational attainment, individuals with a bachelor's degree constituted the largest segment of the sample (40.64%), with diploma graduates representing the second most common group (25.96%), senior high school graduates (18.30%), and postgraduate degree holders (15.11%). The relatively high proportion of tertiary-educated respondents indicates that the sample possesses adequate educational capacity to evaluate technological innovations such as EV.

Occupationally, respondents were primarily private sector employees (30.64%), followed by government employees (18.94%), students (18.72%), entrepreneurs (17.66%), and other occupations (14.04%). This distribution reflects a diverse economic background and suggests exposure to different socio-economic perspectives regarding vehicle adoption.

Regarding monthly earnings, 31.91% of the sample fell within the IDR 2,000,000 to IDR 5,000,000 range, while 25.32% reported an earning between IDR 5,000,001 and IDR 7,000,000. Additionally, 19.15% of participants earned between IDR 7,000,001 and IDR 9,000,000. This distribution suggests that the respondents possess a mid-level financial capacity, which may partially explain the strong influence of price value observed in the structural model. Overall, the respondent profile demonstrates that the sample is socio-economically active, relatively well educated, and economically diverse, making it appropriate for examining EV adoption intention in an emerging economy context.

Measurement Model Evaluation

Before examining structural linkages, the measurement model was rigorously appraised to ensure the reliability and validity of the latent variables. Internal consistency was verified using multiple criteria:

a) Cronbach's alpha, which evaluates inter-indicator correlations (where values above 0.70 signify high reliability)
b) Composite reliability
c) The Dijkstra-Henseler (ρA) coefficient, the latter of which also adheres to a recommended 0.70 threshold.

The outcomes of the PLS analysis are depicted in Figure 1, highlighting the path coefficients (ρ), their corresponding p-values, and the model's explanatory power as reflected by the R^2 value.

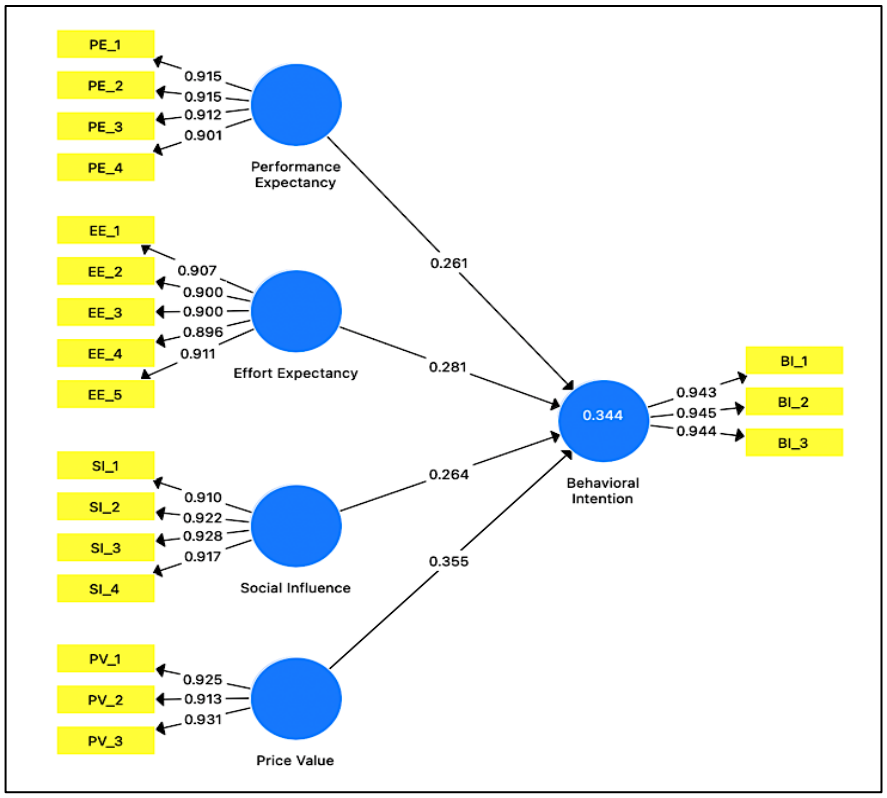

Figure 1: Measurement Model

Table 1: Internal Reliability and Average Variance Extracted

Constructs	Internal Consistency/Reliability			Average Variance Extracted (AVE)
	Cronbach's Alpha	rho_A	Composite Reliability	
Behavioral Intention	0.939	0.939	0.961	0.891
Effort Expectancy	0.943	0.947	0.957	0.815
Performance Expectancy	0.932	0.932	0.951	0.830
Price Value	0.914	0.920	0.945	0.852
Social Influence	0.939	0.948	0.956	0.845

Table 1 presents the values of the three indices for four measurement scales related to the behavioral intention to adopt EVs. These values, which are all above 0.70, indicate that the scales have sufficient reliability.

Internal Consistency Reliability

Strong internal consistency across all indicators supports the measuring model's dependability. Specifically, Cronbach's alpha values (0.914–0.943) and composite reliability scores (0.945–0.967) consistently exceeded the recommended thresholds, ensuring the dependability of the research instrument as detailed in Table 1.

Convergent Validity

The Average Variance Extracted (AVE) was used to verify convergent validity, guaranteeing that indicators appropriately represent the underlying structures. All AVE scores (0.815–0.891) significantly exceeded the 0.50 benchmark. This signifies that the constructs explain a substantial portion of the variance in their respective indicators, establishing a superior level of convergent validity for the measurement model.

Discriminant Validity

Two principal techniques were used to assess discriminant validity: the Fornell- Larcker criterion and the heterotrait- monotrait (HTMT) ratio :

Fornell-lacker Criterion

The model establishes discriminant validity according to the Fornell-Larcker method, as the square root of the AVE for each latent variable exceeds its correlation with any other construct as shown in Table 2. With diagonal values ranging between 0.903 and 0.944, the findings indicate that each construct captures more unique variance from its indicators than from other model components, thus validating the distinctiveness of the variables.

Table 2: The Fornell -larcker Criterion

Constructs	Behavioral Intention	Effort Expectancy	Performance Expectancy	Price Value	Social Influence
Behavioral Intention	0.944				
Effort Expectancy	0.299	0.903			
Performance Expectancy	0.282	0.082	0.911		
Price Value	0.338	-0.002	-0.020	0.923	
Social Influence	0.252	-0.010	0.022	-0.043	0.919

The HTMT ratio was subsequently analyzed to provide additional confirmation of discriminant validity. While values below 0.90 are generally acceptable, a more conservative benchmark of 0.85 is often preferred to ensure distinctiveness. As illustrated in Table 3, the HTMT scores range from 0.027 to 0.363, falling well below even the most stringent threshold. These results offer compelling evidence that the latent variables are empirically unique and represent separate theoretical constructs within the modified UTAUT2 model.

Table 3: Heterotrait-monotrait (HTMT)

Constructs	Behavioral Intention	Effort Expectancy	Performance Expectancy	Price Value	Social Influence
Behavioral Intention					
Effort Expectancy	0.316				
Performance Expectancy	0.302	0.089			
Price Value	0.363	0.031	0.036		
Social Influence	0.265	0.027	0.029	0.047	

Table 4: Indicator Reliability

Indicator	VIF	Indicator	VIF	Indicator	VIF
BI_1	4.130	EE_5	3.807	PV_3	3.503
BI_2	4.270	PE_1	3.617	SI_1	3.520
BI_3	4.251	PE_2	3.517	SI_2	3.572
EE_1	3.526	PE_3	3.501	SI_3	3.949
EE_2	3.579	PE_4	3.030	SI_4	3.919
EE_3	3.393	PV_1	2.976		
EE_4	3.443	PV_2	3.081		

Structural Model Evaluation

A structural model can be used to examine how endogenous constructs affect each other through linear regression by defining the relationships between the different constructs.

Collinearity Assessment

The structural model was tested for collinearity using VIF diagnostics. With all indicators yielding values under the recommended limit of 5 as indicated in Table 4, the model demonstrates a lack of multicollinearity, ensuring the independence of the predictors used in this study.

Coefficient of Determination

The R^2 coefficient was used to evaluate the explanatory power of the model; 0.75, 0.50, and 0.25 denote significant, moderate, and weak effects. With an R^2 of 0.344 and an adjusted R^2 of 0.399, the four UTAUT2 constructs explain about 34.4% of the variance in EV adoption intentions. This suggests that while these predictors are significant, additional factors like infrastructure and culture also play a role in shaping adoption behavior.

f^2 Effect Size

Beyond assessing R^2 values, the f^2 effect size is utilized to determine whether the exclusion of a specific exogenous construct significantly alters the explained variance of the endogenous variables. Following established criteria, f^2 values of 0.02, 0.15, and 0.35 are interpreted as representing small, medium, and large effects, respectively, of the external latent variable on the model.

Table 5: Effect Size (f^2)

Constructs	Behavioral Intention
Effort Expectancy	0.120
Performance Expectancy	0.103
Price Value	0.192
Social Influence	0.106

Table 5 illustrates that the perceived ease of use and the perceived value of price exhibit a moderate effect size, which implies that eliminating them from the framework would significantly decrease the explained variance in behavioral intention. Conversely, perceived performance and social factors display a small to moderate effect size, indicating that while social influence and practical advantages affect intention, they do not solely explain a substantial part of the variance.

Measurement Model Evaluation

The structural framework was evaluated through bootstrapping with resampling to determine the importance of the proposed connections. The findings, outlined in Table 6, show that every proposed connection is positive and holds statistical significance.

Table 6: Path Coefficients and Hypothesis Testing

Hypothesis	Original Sample (O)	T Statistic (O/STD)	p - value	Result
Effort Expectancy -> Behavioral Intention (H_2)	0.281	7.675	0.000	Support
Performance Expectancy-> Behavioral Intention (H_1)	0.261	6.558	0.000	Support
Price Value-> Behavioral Intention (H_4)	0.355	9.049	0.000	Support
Social Influence -> Behavioral Intention (H_3)	0.264	7.304	0.000	Support

Bootstrapping produced the following standardized path coefficients and significant :

a) Effort Expectancy -> Behavioral intention : $\beta = 0.281$, $t = 7.675$, $p < 0.005$ (H_2 supported)

b) Performance Expectancy -> Behavioral intention : $\beta = 0.261$, $t = 6.558$, $p < 0.005$ (H_1 supported)

c) Price Value -> Behavioral intention : $\beta = 0.355$, $t = 9.049$, $p < 0.005$ (H_4 supported)

d) Social Influence -> Behavioral intention : $\beta = 0.264$, $t = 7.304$, $p < 0.005$ (H_3 supported)

All hypothesized paths are positive and highly significant, with t values substantially above the critical value of 1.96. These results provide clear empirical support for H_1 - H_4.

Discussion

The suggested parsimonious UTAUT2 framework exhibits statistically significant explanatory power, yet the R^2 value of 0.344 reveals that a considerable fraction of behavioural intention remains unaccounted for. This indicates that the adoption of EV in emerging economies is likely affected by several contextual, psychological, infrastructural, and policy-related elements not encompassed in the current model (27). Factors include environmental awareness, availability of charging infrastructure, faith in government, perceived technological risk, and regulatory assistance may further elucidate customer adoption intentions (28). The moderate explanatory power noted in this study further illustrates the difficulties of EV uptake in emerging markets. In contrast to mature markets with established EV ecosystems, consumers in developing economies frequently encounter greater uncertainty concerning infrastructural preparedness, long-term operational dependability, and economic viability. Consequently, the intention to adopt electric vehicles must be recognised as a multifaceted phenomena influenced by extensive socioeconomic and institutional factors.

Price Value

Of all the variables analyzed, price value ($\beta = 0.355$, $t = 9.049$, $f^2 = 0.192$) emerged as the primary determinant of behavioral intention. This finding underscores the pivotal role of economic evaluation in the uptake of high-involvement sustainable innovations. EVs require substantial upfront investment, and potential adopters appear to engage in rational cost-benefit analysis before forming adoption intention. This result is consistent with empirical evidence from other emerging market studies reporting cost sensitivity as a primary barrier for EV adoption (29). Other studies also validate that price value influences e-wallet user intentions during the Covid 19 pandemic (17) and the intention to e-scooter adoption in Iran (24). It underscores that, beyond environmental rhetoric, pragmatic economic assessments determine much of adoption intention in price-sensitive markets. The results of this study reveal significant contextual disparities when compared to many UTAUT2 based investigations undertaken in affluent nations. Studies in industrialised nations often identify environmental concern, technological innovation, and sustainability orientation as primary factors influencing electric vehicle adoption behaviour (30). Conversely, the current study demonstrates that economic assessment and operational feasibility exert greater influence within the context of an emerging economy. The price value appeared as the most significant predictor of behavioural intention, indicating that customers in developing countries tend to prioritise cost and long-term financial viability over environmental or lifestyle factors.

Effort Expectancy

Effort Expectancy ($\beta = 0.281$, $t = 7.675$, $f^2 = 0.120$) is second strongest predictor. This emphasizes that perceived operational simplicity, including charging area, vehicle handling, and maintenance accessibility, reduces psychological barriers to adoption. Customers may penalize technology seen as complicated or infrastructure-dependent in emerging EV markets due to a lack of practical knowledge. Our results are consistent with adoption research that shows usability to be a barrier during the initial stages of diffusion (31, 32).

Social Influence and Performance Expectancy

Both Social Influence ($\beta = 0.261$, $t = 6.558$, $f^2 = 0.106$) and Performance Expectancy ($\beta = 0.264$, $t = 7.304$, $f^2 = 0.103$) yielded significant but smaller contributions. Social influence's effect is consistent with findings in collectivist or socially networked societies where peer endorsement, family advice,

and observable adoption create normative pressure for uptake (16, 33). Performance Expectancy remains relevant; adopters care that EV deliver reliability and operational benefits, but such performance advantages translate into intention more strongly when concerns are addressed (15).

Theoretical Contribution

Theoretical contributions emerge in the Contextual adaptation of UTAUT2: the results support a parsimonious, context-sensitive use of UTAUT2 for high involvement technologies in emerging economies. The selective model (performance expectancy, effort expectancy, social influence, and price value) yields robust explanatory power (R^2 = 0.344) without unnecessary complexity, aligning with the notion that theory must be adapted to technology characteristics and market contexts (18). The combination of effort expectancy and social influence suggests adoption interventions should be multipronged: reduce perceived complexity and mobilize social channels for diffusion.

Conclusion

Findings from this research, which applied a simplified UTAUT2 model to 470 survey responses, highlight the primary drivers of EV adoption in an emerging economy. Through PLS-SEM analysis, performance expectancy, effort expectancy, social influence, and price value were all confirmed as significant determinants. Price value held the strongest predictive power, with effort expectancy, social influence, and performance expectancy following in order of significance. This study highlights that economic assessment is the primary driver of EV adoption in price-sensitive emerging economies. Prospective users weigh financial trade-offs more heavily than social or functional factors, with price value serving as the most significant predictor of intention. By streamlining the UTAUT2 model, this research demonstrates that a context-aware approach offers superior explanatory power for capital-intensive technologies. It underscores that in developing nations, financial pragmatism is central to the acceptance of sustainable shifts.

Policy interventions should therefore prioritize financial tools such as subsidies and flexible loans over environmental rhetoric. When combined with improved infrastructure and community-led social programs, these economic measures can significantly accelerate adoption. While the model explains 34.4% of the variance, future studies should move beyond cross-sectional data to explore evolving social norms and additional variables like regulatory support. Ultimately, a holistic strategy that aligns economic viability with usability and social approval is essential for scalable EV growth.

Future Research Direction

Future study should enhance the current model by integrating supplementary contextual, psychological, and environmental variables that could elucidate electric vehicle adoption behavior in emerging nations. Longitudinal studies investigating real adoption behavior and post-adoption usage patterns might yield greater understanding of the long-term sustainability of electric vehicle acceptance. Moreover, comparative analyses across various locations, demographic cohorts, and degrees of infrastructural preparedness may enhance the knowledge of electric car adoption patterns in emerging nations.

Limitation

This study does not explicitly include environmental knowledge or sustainability attitudes in the suggested model. Future research should incorporate environmental and psychological factors to more accurately reflect the multifaceted aspects of EV adoption behavior.

Abbreviations

BI: Behavioral Intention, EE: Effort expectancy, PE: Performance expectancy, PLS-SEM: Partial Least Squares Structural Equation Modeling, PV: Price Value, SI: Social Influence.

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Author Contributions

I Made Dwi Budiana Penindra: Conceptualization, Methodology, Investigation, Writing, Review and Editing, Dewa Made Priyantha Wedagama: Conceptualization, Methodology, Investigation, Supervision, I Gusti Ngurah Priambadi: Conceptualization, Methodology, Investigation, Supervision, Anak Agung Istri Agung Sri Komaladewi :

Conceptualization, Investigation, Supervision, I Ketut Suarsana: Conceptualization, Writing, Review and Editing.

Conflict of Interest

There is no conflict of interest disclosure by the authors.

Data Availability

The data supporting this study's findings are available from the corresponding author upon reasonable request.

Declaration of Artificial Intelligence (AI) Assistance

The authors declare that the generative artificial intelligence (AI) tool grammarly was used exclusively for language editing and/or grammatical improvement

Ethics Approval

This study received ethical clearance from Udayana University under ethical approval number 001/KEP_EC/2026. All respondents participated voluntarily and were informed about the objectives and procedures of the study prior to data collection. Participant anonymity and data confidentiality were fully maintained throughout the research process.

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