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Extending the Technology Acceptance Model for Electric Vehicle Adoption in Palembang

Ghia Subagja[1], Reska Rahmatullah[2], Ahmad Khoirun Najib[3], and Rahellia Panjaitan[4]*

[1,2,3,4] *Universitas Sriwijaya, Indonesia*

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A B S T R A C T

This study aims to analyzes electric vehicle (EV) adoption in Palembang, Indonesia by extending the Technology Acceptance Model (TAM) with environmental concern and government support. EV adoption is increasingly important as cities seek to reduce transport emissions, but growing urban areas still face practical and behavioral barriers. A quantitative survey of 300 EV users in Palembang was conducted through an online questionnaire capturing daily experience, perceived benefits, ease of use, and views on government support. Data were analyzed using Partial Least Squares–Structural Equation Modeling (PLS-SEM). The findings show that perceived usefulness and perceived ease of use have positive and significant effects on EV adoption. Perceived ease of use also has a positive and significant effect on attitude, and attitude further supports adoption. Environmental concern and government support likewise have positive and significant effects, indicating that care for the environment and supportive policies and infrastructure strengthen users' decisions. Overall, the results suggest that EV adoption is shaped by both technology perceptions and wider policy support. These findings imply that faster EV uptake in Palembang can be supported by improving usability and charging convenience, communicating clear benefits, and expanding incentives, charging facilities, and consistent public information to reduce uncertainty and encourage wider adoption locally.

KATA KUNCI

Model Penerimaan Teknologi, Sikap, Kepedulian Lingkungan, Dukungan Pemerintah, Adopsi Kendaraan Listrik

CORRESPONDING AUTHOR

ghiasubagja@fe.unsri.ac.id

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A B S T R A K

Penelitian ini bertujuan untuk menganalisis adopsi kendaraan listrik (EV) di Palembang, Indonesia dengan memperluas Model Penerimaan Teknologi (TAM) melalui penambahan kepedulian lingkungan dan dukungan pemerintah. Adopsi EV semakin penting seiring upaya kota-kota menekan emisi transportasi, namun di wilayah perkotaan yang sedang berkembang masih terdapat hambatan praktis dan perilaku yang memengaruhi keputusan adopsi. Penelitian ini menggunakan survei kuantitatif terhadap 300 pengguna EV di Palembang melalui kuesioner *online* yang menggali pengalaman penggunaan sehari-hari, manfaat yang dirasakan, kemudahan penggunaan, serta penilaian responden terhadap dukungan pemerintah. Data dianalisis menggunakan *Partial Least Squares–Structural Equation Modeling* (PLS-SEM). Hasil menunjukkan bahwa *perceived usefulness* dan *perceived ease of use* berpengaruh positif dan signifikan terhadap adopsi EV. *Perceived ease of use* juga berpengaruh positif dan signifikan terhadap sikap, dan sikap turut mendorong adopsi. Kepedulian lingkungan dan dukungan pemerintah juga memberikan pengaruh positif dan signifikan, yang menegaskan bahwa perhatian terhadap lingkungan serta kebijakan dan infrastruktur yang mendukung memperkuat keputusan pengguna. Secara keseluruhan, adopsi EV dipengaruhi oleh persepsi terhadap teknologi sekaligus dukungan kebijakan yang lebih luas. Temuan ini mengindikasikan bahwa percepatan adopsi EV di Palembang dapat didorong melalui peningkatan kemudahan penggunaan dan kenyamanan pengisian daya, penyampaian manfaat yang jelas, serta perluasan insentif, fasilitas pengisian, dan informasi publik yang konsisten untuk mengurangi ketidakpastian dan mendorong penerimaan yang lebih luas.

1. Introduction

The development of electric vehicle (EV) technology is a strategic response to complex transportation problems and evolving global social issues, aligning with the sustainable development agenda that emphasizes the importance of transformation towards a more environmentally friendly and efficient direction [1]. Electric vehicles (EV) are designed as an alternative, prioritizing technological advancements such as the addition of automatic steering assistance features, the use of battery power, and connectivity during driving, all in an effort to reduce dependence on fossil fuels and curb carbon emissions. Indonesia is directing its transformation toward the transportation sector as a top priority in accelerating the national energy transition [2].

According to a report from the Institute for Essential Services Reform (IESR), motor vehicle emissions are the third largest source of CO_2 emissions in Indonesia [3]. Most emissions from the transportation sector, about 90%, come from urban transportation activities. Among these modes, passenger cars are the highest contributors to emissions, accounting for 78%, or the equivalent of 106 million tons of CO_2 per year [4]. Indonesia's commitment to sustainable energy can be seen thru [5] concerning the acceleration of the use of battery-based electric vehicles (EV). This regulation was adapted as a foundation for accelerating the adoption of electric vehicles (EV) in various sectors, which is then reflected in the positive trend of national electric vehicle (EV) sales. Recent data shows a significant increase in electric vehicle distribution in recent years, indicating that this policy is beginning to have a real impact on market growth and public acceptance [6], [7]. Although the growth trend in electric vehicle (EV) adoption is increasing, the national adoption rate is still considered low, with distribution still limited to urban areas with adequate infrastructure readiness.

Some existing studies attempt to unravel this issue by examining the factors underlying the acceptance of a technology thru the Technology Acceptance Model (TAM) [8]. Research conducted proves the relevance of the TAM model in explaining users' technology acceptance behavior [9]. One of the most frequently identified factors is perceived usefulness (PU) [10], namely, to what extent individuals perceive the use of electric vehicles (EV) as providing tangible benefits, such as cost efficiency, driving comfort, and contribution to the environment [11]. Additionally, perceived ease of use also plays a significant role in influencing adoption decisions, as the ease of operation, charging, and maintenance of electric vehicles (EV) can increase users' willingness to switch from conventional vehicles [12].

These two perceptions then form an attitude, which is an individual's positive or negative stance toward the use of electric vehicles (EV) as a new transportation technology [13]. This attitude is not only influenced by the functional aspects of technology, but also by the values individuals hold, including users' orientation toward the ecological sustainability of the environment [14].

It is at this point that environmental concern becomes relevant, as individuals' level of concern for environmental issues often strengthens positive attitudes toward the adoption of environmentally friendly technologies such as electric vehicles (EV) [15]. Individual decisions are also heavily influenced by the presence of credible and consistent government support [16]. Therefore, government support is one of the factors that can trigger psychological and perceptual actions, such as incentives, and the provision of supporting infrastructure facilities provided by the government to strengthen public belief that using electric vehicles (EV) is a viable, safe, and profitable choice [17].

Previous research on electric vehicle (EV) adoption still focuses on areas with qualify infrastructure, such as Jakarta and its surrounding areas [18]. Therefore, it has not yet explained the pattern of technology adoption in developing cities like Palembang. Additionally, the direct effect of environmental concern and government support on electric vehicle (EV) adoption behavior has not been extensively tested, while previous studies (TAM) have not comprehensively integrated these two factors. This context enables the examination of the combined effects of perceived usefulness (PU), perceived ease of use (PEOU), attitude, environmental concern, and government support on electric vehicle (EV) adoption in Palembang. This study adoption model based on the Technology Acceptance Model (TAM), adapted to the socio-economic conditions, public perceptions, and government policy implementation support local.

This study is expected to contribute to the literature on technology adoption behavior in urban settings while also providing empirical evidence to support the development of more contextualized, measurable, and evidence-based strategies to accelerate electric vehicle (EV) adoption. Specifically, this study aims to examine the extent to which perceived usefulness (PU), perceived ease of use (PEOU), attitude (ATT), environmental concern (EC), and government support (GS) influence the adoption of electric vehicles (EVs) in Palembang.

2. Research Method

This research uses a quantitative approach to analyze the relationship between perceived usefulness, perceived ease of use, attitude, environmental concern, government support and adoption behavior. The research was conducted in Palembang, South Sumatera, Indonesia, representing a major urban in Indonesia that has recently initiated the adoption of electric vehicles. Data were collected between July to December 2025 through an online survey, following the stages of instrument preparation, data collection, and data analysis, to ensure efficient and accessible responses.

2.1. Research Design and Sample

The population of this study consisted of 300 respondents from the total population. This total number of respondents was obtained based on calculations using the formula [19]. A purposive sampling method was employed using the following inclusion criteria:

a. Residing in the city of Palembang

b. Over 17 years of age

c. Owning an electric vehicle (EV)

The data in this study is primary, meaning it is obtained directly from the source.

2.2. Measurement Instrument and Variable Characterization

Research data were obtained using a structured questionnaire constructed from established theoretical frameworks via Google forms and social media of the user community electric vehicles (EV) as data collection instruments. The measurement technique using a 1-5 Likert scale was used to measure the questionnaire. The operationalization of the study variables is outlined in Table 1.

Table 1. Variables and Measurements

Variables	Code	Measurements	Sources
Perceived Usefulness (PU)	PU1, PU2, PU3, PU4	Electric vehicles support technological development, reduce household expenses, make more productive and boost driving effectiveness.	[20]
Perceived Ease of Use (PEOU)	PEOU1, PEOU2, PEOU3	I think electric vehicle easy to drive, easy to learn and easy to charge.	[21]
Attitude (ATT)	ATT1, ATT2, ATT3	I like electric cars, I buy EV because of positive attitudes and I am fond of the concept of utilizing Evs.	[22]
Environmental concern (EC)	EC1, EC2, EC3, EC4	I am willing to make sacrifice to protect the environment, individuals have a responsibility to protect environment, buy EV due to the air pollution crisis and contribute to save the environment for the next generation.	[23]
Government support (GS)	GS1, GS2, GS3, GS4	Government supports to promote EV as effective, there is government policy, government initiatives charging infrastructure and there is tax incentives.	[17]
Adoption EV (AEV)	AEV1, AEV2	I'll give priority to buy EV and intend to buy EV.	[24]

2.3. Research Model and Figure Representation

The conceptual research model consists of the core constructs of the Technology Acceptance Model (TAM), namely perceived usefulness, perceived ease of use, and attitude, and is further extended by including environmental concern and government support as external variables that affect public adoption behavior toward electric vehicles in Palembang. The model can be seen on Figure 1. All variables are hypothesized to be structurally related and empirically testable, thereby providing a comprehensive explanation of the determinants of electric vehicle adoption in the study area.

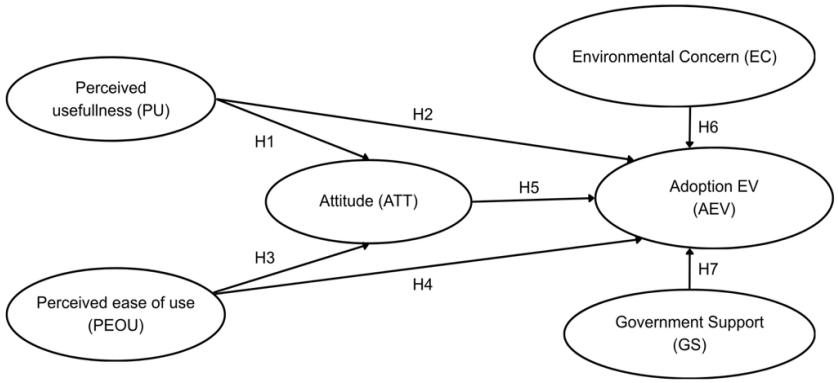

Figure 1. Conceptual Framework

2.4. Data Analysis Technique

Data were analyzed using Partial Least Squares–Structural Equation Modeling (PLS-SEM) with the assistance of SmartPLS 4 software. This method was chosen due to its ability to handle complex latent constructs, mediation effects, and non-normally distributed data, which are frequently observed in survey-based studies.

The analysis was consisted in two main stages. First, the evaluation of the measurement model (outer model) was conducted to assess the validity and reliability of the constructs, including the evaluation of factor loadings, Composite Reliability, Cronbach's Alpha, and Average Variance Extracted (AVE). Second, the inner model was used to evaluate structural relationships among variables using path coefficients and R^2, while bootstrapping was applied to test the statistical significance of each path. This approach enabled accurate estimation of the effects of perceived usefulness, perceived ease of use, attitude,

environmental concern, and government support on electric vehicle (EV) adoption in Palembang.

3. Result and Discussion

3.1. Convergent Validity

Convergent validity was examined through indicator outer loadings and Average Variance Extracted (AVE). The results on Table 2 show that all measurement indicators for perceived usefulness, perceived ease of use, attitude, environmental concern, government support, and electric vehicle (EV) adoption have outer loading values exceeding the recommended threshold of 0.70. Furthermore, all AVE values are above 0.50, indicating that each construct explains more than half of the variance of its indicators. These findings confirm that convergent validity has been satisfactorily achieved.

Table 2. Convergent Validity Test

Variable	1	2	3	4
AEV	0.869	0.872	0.884	0.888
ATT	0.868	0.920	0.891	
EC	0.882	0.864	0.868	0.778
GS	0.870	0.891	0.878	0.790
PEOU	0.930			
PU				

3.2. Discriminant Validity

Discriminant validity was assessed using the Fornell–Larcker criterion. The results on Table 3 demonstrate that the square root of the AVE for each construct is greater than its correlations with other constructs in the model. This indicates that each latent variable is empirically distinct and captures a unique aspect of electric vehicle (EV) adoption behavior.

Table 3. Fornell-Larcker Criterion Value

Variable	AEV	ATT	EC	GS	PEOU	PU
AEV	0.879					
ATT	0.661	0.893				
EC	0.764	0.540	0.849			
GS	0.651	0.489	0.579	0.858		
PEOU	0.774	0.572	0.738	0.576	0.905	
PU	0.685	0.556	0.644	0.523	0.651	0.885

3.3. Reliability Test

Reliability was evaluated using Composite Reliability and Cronbach's Alpha. The results reveal that all constructs exceed the recommended threshold value of 0.70, indicating a high level of internal consistency. Therefore, the measurement instruments used in this study are considered reliable and suitable for structural model analysis.

Table 4. Reliability Test

Variable	Cronbach's Alpha	Composite Reliability	AVE
AEV	0.879		
ATT	0.661	0.893	
EC	0.764	0.540	0.849
GS	0.651	0.489	0.579
PEOU	0.774	0.572	0.738
PU	0.685	0.556	0.644

3.4. Structural Model Evaluation (Inner Model)

The structural model evaluation focused on assessing the explanatory power of perceived usefulness, perceived ease of use, attitude, environmental concern, and government support in predicting electric vehicle (EV) adoption. The coefficient of determination (R^2) for electric vehicle (EV) adoption on Table 5 indicates that the independent variables explain a substantial proportion of variance in adoption behavior. The results show that the model TAM used in this study can explain electric vehicle adoption in Palembang at a moderate level.

Table 5. R Square Test Result

Variable	R-Square	R-Square Adjusted
Adoption EV	0.753	0.746
Attitude	0.386	0.380

3.5. Hypothesis Testing

Hypothesis testing was conducted using the bootstrapping procedure in SmartPLS. The results on Figure 2 and Table 6 indicate that perceived usefulness has a significant positive effect on electric vehicle adoption. Perceived ease of use significantly influences attitude toward electric vehicles (EV), and this has a significant positive effect on adoption behavior.

In addition to the core TAM variables, environmental concern and government support also show significant positive effects on electric vehicle (EV) adoption. These findings indicate that all hypotheses are supported, confirming the relevance of both technological perceptions and contextual factors in explaining electric vehicle (EV) adoption.

Table 6. Hypothesis Testing

Variable	Original Sample (O)	T Statistics (|O/STDEV|)	P Values
PU → ATT	0.319	2.657	0.008
PU → AEV	0.130	2.071	0.038
PEOU → ATT	0.364	3.070	0.002
PEOU → AEV	0.280	3.959	0.000
ATT → AEV	0.074	2.081	0.037
EC →AEV	0,169	2,565	0,010
GS → AEV	0.267	3.619	0.000

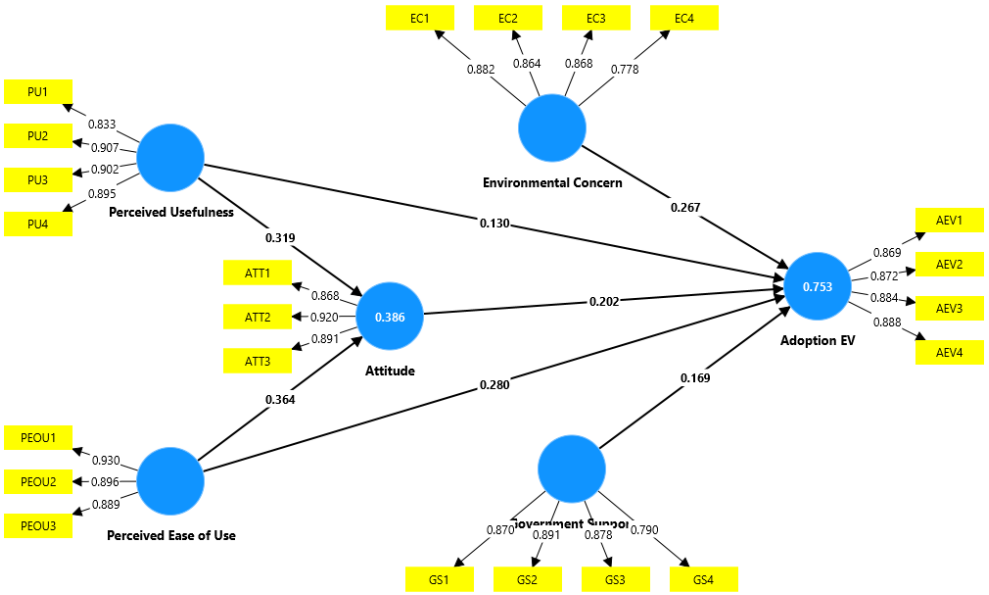

Figure 2. Hypothesis Testing

3.6. Discussion

The findings of this study indicate that electric vehicle (EV) adoption in Palembang can be effectively explained using an extended Technology Acceptance Model (TAM) that integrates technological, psychological, and contextual factors. This result suggests that EV adoption is influenced by more than technical aspects alone, but also by users' perceptions and surrounding conditions. In addition, the descriptive statistics show that respondents generally perceive electric vehicles as useful, easy to use, and environmentally friendly, which provides a strong initial foundation for adoption behavior.

The significant effect of perceived usefulness confirms that functional benefits play an important role in shaping decisions to adopt electric vehicles. Benefits such as cost efficiency, improved productivity, and contributions to environmental protection encourage individuals to consider EVs as a viable transportation option. This finding supports the Technology Acceptance Model, which identifies perceived usefulness as a key factor influencing technology acceptance.

Perceived ease of use is also found to significantly influence users' attitudes toward electric vehicles. When electric vehicles are considered easy to operate, easy to learn, and convenient to charge, users tend to develop more positive evaluations of the technology. This finding highlights the importance of user-friendly design and accessible infrastructure in accelerating electric vehicle adoption.

Attitude appears as a key mediator between technological perceptions and adoption behavior. Individuals who have positive attitudes toward electric vehicles are more likely to translate their perceptions into actual adoption decisions. This suggests that emotional and evaluative responses play a central role in behavioral decision-making within the transportation sector.

Environmental concern also significantly contributes to electric vehicle adoption behavior. Individuals who are more aware of environmental issues tend to prefer cleaner and more sustainable transportation options. This result extends the Technology Acceptance Model by incorporating normative and value-based considerations that are particularly relevant in the context of green technology adoption. Government support also plays a significant role in influencing electric vehicle adoption. Policy incentives, infrastructure development, and regulatory commitment reduce uncertainty and perceived risk, thereby strengthening public confidence in electric vehicles. The relatively moderate descriptive mean for government support suggests that while policies exist, their implementation and visibility may still require improvement.

Overall, this study answers the research questions by show that electric vehicle (EV) adoption in Palembang is influenced by the interaction of perceived usefulness, perceived ease of use, attitude, environmental concern, and government support. The absence of contradictory or ambiguous relationships indicates that the proposed extended TAM model is strong and contextually relevant for explaining electric vehicle (EV) adoption in an emerging urban environment

4. Conclusion

This study examined how perceived usefulness, perceived ease of use, attitude, environmental concern, and government support influence electric vehicle (EV) adoption in Palembang by extending the Technology Acceptance Model. The results indicate that all five factors significantly support EV adoption. Ease of use

and government support play the strongest roles, while environmental concern, perceived usefulness, and attitude also contribute to adoption decisions. Overall, EV adoption in Palembang is shaped by a combination of how people evaluate the technology, how much they value environmental benefits, and how strongly policies and infrastructure reduce practical barriers. In line with these results, efforts to increase adoption would benefit from making EV use and charging more convenient and dependable, alongside policy support that is clear and consistently implemented. Public communication that connects EV use with practical and environmental benefits may further strengthen acceptance among wider user groups.

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