International Conference on Sustainable Economics, Management, and Accounting (ICSEMA 2025)
Proceedings
Vol. 01 No. 01 Year 2025, Page 1117-1134

THE INFLUENCE OF SOCIO-DEMOGRAPHIC, TECHNOLOGICAL INNOVATION, AND ENVIRONMENTAL CONCERN ON EV PURCHASE INTENTION MEDIATED BY PERCEIVED RISK

Putri Shahdia A[1*], Ririn Wulandari [2]

[1,2] Faculty of Economics and Business, Universitas Mercu Buana, Jakarta, Indonesia
[*]Email corresponding author: pshahdiaa@gmail.com

Abstract

This study investigates the determinants of purchase intention toward electric vehicles (EVs) in Indonesia, particularly in Surabaya. It analyzes the effects of socio-demographic characteristics (family size and monthly income), environmental concern (self-responsibility and pro-environmental attitude), and technological innovation (battery performance and performance expectation), with perceived risk comprising financial, performance, psychological, and time-related risks as a mediating variable. Grounded in the Technology Acceptance Model (TAM) and complemented by the Diffusion of Innovation (DOI) framework, the study employs SmartPLS 4.0 for structural equation modeling. The findings reveal that environmental concern significantly and positively affects purchase intention, both directly and through perceived risk. Technological innovation also exerts a significant positive influence, with enhanced performance expectations and battery reliability reducing perceived risk and increasing purchase likelihood. Conversely, socio-demographic factors show a significant but negative direct impact on purchase intention and no significant influence on perceived risk. These results highlight that consumer perceptions related to risk and innovation are more decisive than demographic profiles in driving EV adoption, providing actionable insights for marketing strategies and sustainable policy development.

Keyword: Socio-demographic, environmental concern, innovation technology, purchase intention, electric vehicle, Technology Acceptance Model (TAM)

INTRODUCTION

The urgency of climate change mitigation has pushed governments worldwide, including Indonesia, to transition toward low-emission transportation systems. As a response to the Paris Agreement, Indonesia committed to reducing greenhouse gas emissions by 29% with national efforts and up to 41% with international support by 2030. One of the key sectors targeted is transportation, leading to the implementation of Presidential Regulation No. 55 of 2019 and the updated Perpres No. 79 of 2023 to accelerate the adoption of Battery Electric Vehicles (BEVs) (Ministry of Environment and Forestry, 2020). Furthermore, regional regulations such as Surabaya Mayor Regulation No. 112 of 2024 demonstrate local government commitment by mandating the use of EVs within government fleets and encouraging public engagement in sustainable transport. However, adoption in Indonesia especially in urban areas like Surabaya remains slow, with several factors influencing consumer willingness to switch from conventional to electric vehicles (BPK RI, 2024).

Despite comprehensive regulatory frameworks, Indonesia continues to face slow adoption of electric vehicles, particularly in metropolitan areas like Surabaya, where adoption should ideally begin to flourish. The gap between policy implementation and actual consumer behavior is evident in the persistent reluctance to adopt EVs due to multiple perceived and structural barriers. These include concerns over initial purchase cost, limited availability of charging infrastructure, and most importantly consumer hesitation rooted in uncertainty about new technology. Therefore, to accelerate EV adoption, it is vital to understand the psychological and contextual factors that influence purchase intention among Indonesian consumers.

Understanding what influences purchase intention is essential for accelerating EV adoption. The Technology Acceptance Model (TAM) and the Diffusion of Innovation (DOI) theory offer robust frameworks to explore behavioral intention toward new technologies (Mohr & Kühl, 2021). In this context, three main variables have emerged as significant determinants of consumer intention: environmental concern, technology innovation and socio-demographic characteristics. Socio- demographic factors, such as family size and monthly income, also influence purchase intention. While higher income may increase affordability, studies suggest that demographic variables do not always align predictably with behavior, as individuals with similar economic profiles can differ significantly in environmental and technological awareness (Lashari et al., 2021)

Technology innovation, on the other hand, involves consumer expectations about battery performance, system integration, and vehicle reliability. Consumers' perceptions of technological advances such as range capability and charging infrastructure play a critical role in shaping adoption (Kim et al., 2022). These innovations improve perceived usefulness and reduce hesitation toward new technology. Environmental concern reflects an individual's awareness and pro-environmental attitudes, often predicting sustainable behavior. Research shows that environmentally conscious individuals tend to have higher interest in adopting EVs (Lee et al., 2021). Their intention is often influenced by a sense of personal responsibility and the perceived contribution of EVs to environmental protection (Wang et al., 2021)

Additionally, perceived risk encompassing financial, performance, psychological, and time- related concerns acts as a critical mediating factor (Xie et al., 2022). A central component in this model is perceived risk, which serves as a mediating variable between the independent variables and purchase intention. Perceived risk comprises multiple dimensions, such as financial uncertainty, psychological discomfort, performance skepticism, and time investment. These perceptions significantly influence decision-making by amplifying doubts or reinforcing confidence, even when environmental and technological factors are favorable. Consumers often delay or avoid adoption when perceived risks outweigh perceived benefits and caused hesitant to make a purchase despite recognizing environmental or technological benefits.

This study aims to analyze how environmental concern, technology innovation, and socio- demographic characteristics influence the purchase intention of electric vehicles in Surabaya, with perceived risk serving as a mediating variable. Using a modified TAM-DOI framework, the study adopts SEM-PLS 4.0 analysis with 141 respondents who are aware of EVs. The findings reveal that environmental concern and technology innovation both have significant positive effects on purchase intention, both directly and indirectly through the reduction of perceived risk. This implies that enhancing public environmental literacy and promoting the advantages of EV technology can effectively reduce hesitation and stimulate consumer interest. In contrast, socio-demographic variables while statistically significant display a negative direct relationship with purchase intention and no meaningful influence on perceived risk, confirming that behavioral intention is shaped more by personal values and risk evaluations than by income or family size alone.

From a theoretical perspective, this research enriches the literature by integrating perceived risk within the TAM and DOI framework, contextualized in a developing economy where EV adoption is still nascent. The novelty of this study lies in its focus on Surabaya as an emerging urban center and its use of perceived risk as a cognitive-affective mediator that connects environmental values, innovation perception, and behavioral intent. (Yuk et al., 2025). From a practical perspective, the findings suggest that government and industry stakeholders should invest in public education, increase the visibility and accessibility of charging infrastructure, and offer trial programs or warranties that reduce uncertainty. Rather than relying on socio-demographic segmentation alone, marketing and policy interventions should address consumers' psychological readiness and reduce barriers related to perceived risks. By doing so, Indonesia can better align its sustainability targets with consumer behavior and accelerate the nationwide transition toward electric mobility.

LITERATURE REVIEW AND HYPOTHESIS FORMULATION

Literature Review

Understanding consumers' behavioral intentions toward electric vehicle (EV) adoption can be effectively approached through established theoretical frameworks such as the Technology Acceptance Model (TAM) and Diffusion of Innovation (DOI) theory. TAM, introduced by Davis (1989), posits that individuals' behavioral intentions are influenced by perceived usefulness and perceived ease of use (Lashari et al., 2021). This model has been extensively applied to explain EV adoption by highlighting how consumers perceive technological functionality in their purchasing decisions.

Meanwhile, the DOI theory by Rogers (2006) explains innovation diffusion across social systems, emphasizing variables such as relative advantage, compatibility, complexity, observability, and trialability. These attributes help categorize adopters and understand their likelihood of embracing innovations such as EVs. In your study, TAM and DOI are integrated to frame a comprehensive conceptual model linking cognitive perceptions, innovation attributes, and behavioral outcomes. Together, these models form a comprehensive framework that explains the psychological and technological dimensions influencing consumer decisions to adopt electric vehicles (EVs). Empirical studies have further examined the role of socio-demographic factors such as income, education, and family size in shaping consumer intention. Although these variables are traditionally used to segment consumers, recent research indicates that they do not always directly influence perceived risk or purchase intention.

Several studies have investigated the impact of socio-demographic factors on electric vehicle (EV) purchase behavior. Lashari et al. (2021) examined age, income, education, and household characteristics in relation to EV acceptance. Their findings suggest that while higher income and urban residency correlate with early adoption, socio-demographic traits alone do not strongly predict purchase decisions. Ling et al., (2021) further observed that consumers with similar incomes may show divergent intentions due to psychological readiness, environmental values, or access to EV infrastructure.

In an Indonesian context, Veza et al. (2022) confirmed that younger and more educated consumers perceive lower risk toward EV adoption, contrasting with older or lower-income individuals who associate EVs with higher financial and infrastructural uncertainty. These findings support the hypothesis that socio-demographics exert an indirect influence on purchase intention via mediating perceptions. Another key variable is technology innovation. Previous studies such as Kim et al. (2022) concluded that advancements in battery efficiency, charging systems, and smart integration increase consumer confidence and perceived usefulness, ultimately leading to higher adoption rates. However, these technological enhancements can also introduce complexity, resulting in

psychological resistance among less-informed consumers. This duality is evident in this study's findings, which confirm that technology innovation positively affects purchase intention but may increase perceived risk if not supported by adequate consumer knowledge.

In parallel, environmental concern has become one of the most consistent predictors of EV purchase behavior. Research by Wang et al. (2021), and Kumar & Alok (2020) confirmed that individuals with high ecological awareness are more inclined to adopt green technologies like EVs. Environmental concern in this context acts as both a motivational and cognitive trigger that enhances the perceived benefits of EV adoption. This study reinforces such conclusions by demonstrating that environmental concern not only has a direct and significant effect on purchase intention but also indirectly reduces perceived risk. Perceived risk itself encompassing financial, performance, psychological, and time-based risks plays a mediating role in adoption behavior. As observed by Xie et al. (2022), consumers who perceive EVs as unreliable or costly are likely to delay or abandon their purchase decisions. The mediating effect of perceived risk was confirmed in this research between technology innovation and environmental concern toward purchase intention, but not for socio- demographic factors, indicating that consumer perceptions are more impactful than background characteristics.

Finally, purchase intention remains the focal outcome variable in EV adoption models. It is influenced by a combination of perceived benefits, emotional evaluations, and contextual readiness. Studies by Kartawinata et al. (2020) and Zhang et al. (2018) support this by showing that perceived value, trust in technology, and environmental alignment are primary predictors of purchase behavior. The findings of this study contribute to the literature by integrating cognitive, affective, and behavioral constructs in a single model and validating perceived risk as a key mechanism through which innovation and environmental values shape consumer intention in emerging markets like Indonesia.

Hypothesis Development

The present study adopts the Technology Acceptance Model (TAM) and Diffusion of Innovation (DOI) theory as the foundational framework to investigate what influences consumers' intention to purchase electric vehicles (EVs) in Indonesia. According to TAM, an individual's intention to adopt new technology is determined by perceived usefulness and perceived ease of use (Davis, 1989), while DOI explains how the characteristics of innovation such as relative advantage, compatibility, and complexity affect the rate of its adoption (Rogers, 2003). These theories have been widely applied in studies of electric mobility and sustainable technology adoption.

Previous research by Ling et al. (2021) and Lashari et al. (2021) shows that socio-demographic variables influence access to innovation, affordability, and lifestyle compatibility. However, these variables often have limited explanatory power unless moderated or mediated by attitudinal or psychological factors such as perceived risk. In this study, socio-demography is proposed to influence both purchase intention and perceived risk.

H1: Socio-demography significantly influences the intention to purchase intention
an EV H5: Socio-demography significantly influences perceived risk

Technology innovation is operationalized through two constructs: battery performance and performance expectation. Battery performance includes reliability, charging speed, and driving range attributes that determine practicality. Performance expectation reflects consumer beliefs that EVs can meet everyday transportation needs. Studies by Liu et al. (2020) confirm that innovation increases perceived usefulness but may also raise uncertainty if consumers lack technical familiarity. Therefore, this research hypothesizes a dual pathway between technology innovation and both behavioral intention

and risk perception.

H2: Technology innovation significantly influences the intention to purchase intention an EV H6: Technology innovation significantly influences perceived risk

Environmental concern, is a reflection of an individual's ecological awareness and personal responsibility toward environmental protection. Wang et al. (2021) found that pro-environmental attitudes significantly influence the adoption of green technologies. Consumers who are environmentally conscious tend to associate EVs with positive societal impact, reducing ethical or psychological resistance. Thus, environmental concern is expected to have both a direct effect on purchase intention and an indirect effect through perceived risk.

H3: Environmental concern significantly influences the intention to purchase intention an EV H7: Environmental concern significantly influences perceived intention risk

Perceived risk refers to consumer doubts or uncertainties about the financial, psychological, performance-related, and time-related consequences of using EVs. Prior research by Xie et al. (2022) and Roemer & Henseler (2022) shows that perceived risk acts as a significant barrier to the adoption of sustainable technologies. Consumers may abandon or delay adoption decisions if they perceive EVs as unreliable, complex, or costly. This study therefore assumes that perceived risk has a direct negative effect on purchase intention.

H4: Perceived risk significantly influences the intention to purchase an EV.

Building on these relationships, this study also proposes perceived risk as a mediating variable, meaning that it explains how socio-demography, technology innovation, and environmental concern indirectly affect purchase intention. Consumers may not act directly based on these factors but through how these factors shape their perception of risk. Thus, the following hypotheses are also proposed:

H8: Perceived risk mediates the effect of socio-demography on purchase intention H9: Perceived risk mediates the effect of technology innovation on purchase intention

H10: Perceived risk mediates the effect of environmental concern on purchase intention

RESEARCH METHODS

Research Design

The research model presented below visually depicts the theoretical relationships proposed in this study, serving as the foundation for hypothesis testing and analysis.

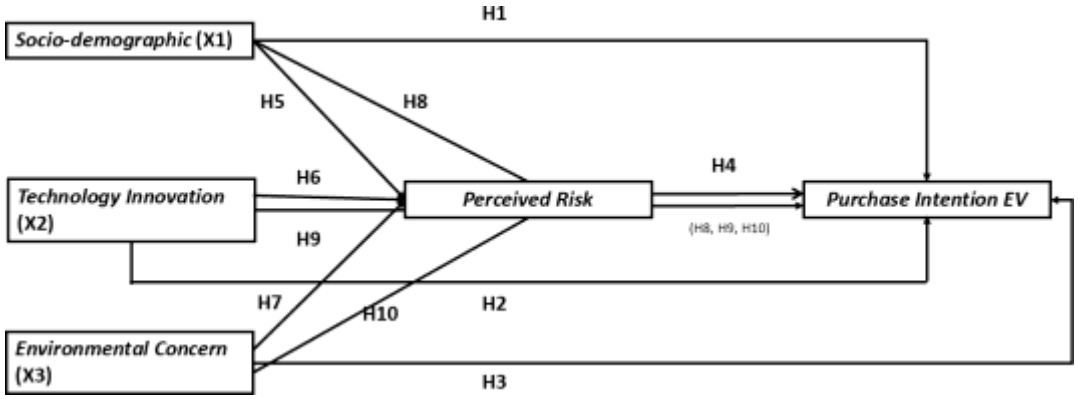

Figure 1. Research Design

Population and Sample

The population targeted in this study consisted of individuals residing in Surabaya, Indonesia, who possess awareness or knowledge about electric vehicles. A non-probability sampling with purposive sampling technique was used to ensure that only respondents who met specific criteria namely those with prior understanding of EVs were included. A total of 200 responses were initially collected via an online survey, and following data cleaning using standard deviation analysis according Hair et al. (2022) to remove invalid or uniform responses, 141 valid responses were retained for analysis.

Data Collection and Instrument Development Technique

The research instrument used was a structured questionnaire adapted from validated indicators in previous studies. Each construct was measured using multiple indicators and evaluated on a 7-point Likert scale ranging from 1 = strongly disagree to 7 = strongly agree. The study measured five core variables: socio-demography (income and household size), technology innovation (battery performance and performance expectation), environmental concern, perceived risk (financial, performance, psychological, and time-related), and purchase intention. A pre-test was conducted to ensure the clarity and reliability of the questionnaire before its full deployment.

Data Analysis Techniques

The collected data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4.0 software. This approach was selected due to its suitability for predictive research models and its capacity to handle small-to-medium-sized samples. The measurement model (outer model) was evaluated through convergent validity, reliability, multicollinearity and model fit. Convergent validity was confirmed when Average Variance Extracted (AVE) exceeded 0.50, while reliability was established using Cronbach's Alpha and Composite Reliability, both above 0.70. Multicollinearity was checked via Variance Inflation Factor (VIF), with acceptable values below 5. While Model fit through SRMR with values below 0.08 indicating as good fit.

The structural model (inner model) was assessed using R^2 (coefficient of determination), f^2 (effect size), and Q^2 (predictive relevance). R^2 values of 0.75, 0.50, and 0.25 indicated substantial, moderate, and weak explanatory power, while f^2 values of 0.35, 0.15, and 0.02 reflected large, medium, and small effect sizes. $Q^2 > 0$ confirmed that the model had predictive capability. Bootstrapping with 5000 subsamples was used for hypothesis testing, where p-values < 0.05 or t- statistics > 1.96 indicated statistical significance (Hair et al., 2022).

RESULT AND DISCUSSION

The current study collected 200 responses, however, 59 responses were considered ineffective due to invalid values. Thus, 141 valid responses were used for the final analysis. Respondents's demographic values are shown in Table 1, indicating that respondents differ in age, gender, family size, occupation, income, educational and car ownership.

Table 1. Demographics of survey respondents.

Item	Option	Frequency	Percentage
Gender	Man	111	78.7%
	Woman	30	21.3%
	18-26 years old	11	7.8%
	27-35 years old	23	16.3%

Age	36-44 years old	22	15.6%
	>44 years old	85	60.3%
Family Size	< 2 person	36	25.5%
	2-3 person	69	48.9%
	4-6 person	22	15.6%
	>6 person	14	9.9%
Monthly Income	< 4 million	21	14.9%
	4-5 million	63	44.7%
	6-10 million	41	29.1%
	11-15 million	12	8.5%
	>15 million	4	2.8%
Occupation	Government Employee	16	11.3%
	Private Employee	90	63.8%
	Enterpreneur	2	1.4%
	Others	33	23.4%
Education	High School	85	60.3%
	Bachelor degree	44	31.2%
	Magister degree	2	1.4%
	Professor degree	0	0.0%
	Others	10	7.1%
Car Ownership	Had a car	70	49.6%
	Hadn't a car	71	50.4%
Total		141	100%

After confirming the characteristics of the 141 valid respondents based on Table 1, the next stage of the analysis involved testing the measurement model to ensure the validity and reliability of each construct. According to Hair et al. (2022), Convergent validity was assessed using the Average Variance Extracted (AVE) and outer loadings. An AVE value above 0.50 indicates that a construct explains more than half of the variance in its indicators, while outer loading values above 0.708 are considered ideal for confirming indicator reliability. Furthermore, reliability testing was conducted using Cronbach's Alpha and Composite Reliability (CR). Both metrics evaluate the internal consistency of the indicators, with values exceeding 0.70 considered acceptable for confirming that the indicators reliably measure their respective constructs.

Table 2. Validity and Reliability

	Reliability		Convergent Validity
	Cronbach's alpha	Composite reliability	Average variance extracted (AVE)
Environmental Concern (EC)	0.882	0.944	0.895
Perceived Risk (PR)	0.852	0.900	0.691
Purchase Intention (PI)	0.895	0.927	0.761
Socio-Demography (SC)	0.445	0.779	0.639
Technology Innovation (TI)	0.742	0.886	0.795

The five reflective constructs (Socio-Demography, Technology Innovation, Environmental Concern, Perceived Risk, and Purchase Intention) used in this study were analyzed, and Table 2 shows the specific results. According to the analysis, the Average Variance Extracted (AVE) values for all variables exceeded the 0.50 threshold, indicating that convergent validity is satisfactory, with each construct explaining more than 50% of the variance in its indicators. The Cronbach's Alpha values ranged from 0.445 to 0.895, while the Composite Reliability values ranged from 0.779 to 0.944. This suggests that most variables exhibit high reliability, especially as Composite Reliability values exceeded the recommended 0.70 threshold (Hair et al., 2022). Although the Cronbach's Alpha for Socio-Demography was below the standard with value 0.445, this is still considered tolerable since the construct is composed of only two indicators and the CR value remains acceptable.

Discriminant validity testing is essential to ensure that each reflective indicator accurately measures its intended construct and remains distinct from other constructs in the model. It confirms that latent variables are both theoretically and statistically unique. In this study, discriminant validity was evaluated using the Fornell–Larcker Criterion, which requires that the square root of AVE for each construct is greater than its correlation with other constructs. This criterion was satisfied across all constructs, supporting that each variable shares more variance with its own indicators than with others. The evidence thus supports that the constructs are clearly differentiated, and confirms that the measurement model meets the criteria for validity and reliability (Hair et al., 2022).

Table 3. Fornell-Larcker Criterion

	Environmental Concern (EC)	Perceived Risk (PR)	Purchase Intention (PI)	Socio-Demography (SC)	Technology Innovation (TI)
Environmental Concern (EC)	0.946				
Perceived Risk (PR)	0.770	0.831			
Purchase Intention (PI)	0.782	0.767	0.873		
Socio-Demography (SC)	-0.271	-0.219	-0.369	0.800	
Technology Innovation (TI)	0.624	0.744	0.646	-0.066	0.891

Based on Table 3 above, discriminant validity was assessed using the Fornell–Larcker Criterion, which compares the square root of the Average Variance Extracted (AVE) for each construct with the correlations between constructs. According to Hair et al. (2022), discriminant validity is established when the square root of each construct's AVE is greater than its correlation with any other construct. As shown in Table 3, the diagonal values represent the square roots of the AVE for each variable. These values are all greater than the inter-construct correlation coefficients in their respective rows and columns, indicating that each construct shares more variance with its own indicators than with others.

In evaluating collinearity or as we know multicollinearity, refers to a condition in which independent variables are highly correlated, which can distort the estimation of path coefficients and weaken the reliability of the model's results. To assess this, the Variance Inflation Factor (VIF) was used. According to Hair et al. (2022), VIF values below 5 indicate an acceptable level of multicollinearity, whereas values exceeding this threshold may suggest problematic collinearity.

Table 4. Multicollinearity

	VIF

Environmental Concern (EC) -> Perceived Risk	1.795
Environmental Concern (EC) -> Purchase Intention (PI)	2.583
Perceived Risk -> Purchase Intention (PI)	3.440
Socio-Demography (SC) -> Perceived Risk	1.100
Socio-Demography (SC) -> Purchase Intention (PI)	1.112
Technology Innovation (TI) -> Perceived Risk	1.670
Technology Innovation (TI) -> Purchase Intention (PI)	2.339

As shown in Table 4, all VIF values in this study ranged from 1.100 to 3.440, with the highest value observed in the relationship between Perceived Risk and Purchase Intention with value 3.440. Since none of the VIF values exceed the critical value of 5, it can be concluded that no multicollinearity issue is present. Thus, all latent predictor constructs used in this model are considered independent and reliable for further structural model analysis.

The Standardized Root Mean Square Residual (SRMR) is an absolute measure of model fit that represents the average magnitude of the discrepancies between the observed correlations and the model-implied correlations. According to Hair et al. (2022), an SRMR value below 0.08 is considered good fit, indicating that the model fits the data well.

Table 5. Model Fit

	Estimated model
SRMR	0.076

As shown in Table 5, the SRMR values for both the saturated model and the estimated model are 0.076, which fall within the acceptable threshold. This result demonstrates that the structural model in this study has a good model fit, and the discrepancies between the observed and predicted matrices are minimal. Thus, the model is appropriate for further hypothesis testing and interpretation.

The coefficient of determination (R^2) is used to evaluate the explanatory power of the exogenous (independent) variables on the endogenous (dependent) variables within the structural model. According to Hair et al. (2022), R^2 values of 0.75, 0.50, and 0.25 can be interpreted as substantial, moderate, and weak, respectively. Additionally, the Adjusted R^2 accounts for the number of predictors in the model, providing a more conservative estimate of explanatory power.

Table 6. Coefficient Of Determination (R^2)

	R-square	R-square adjusted
Perceived Risk (PR)	0.709	0.703
Purchase Intention (PI)	0.715	0.706

As shown in Table 6, the R^2 value for Perceived Risk is 0.703, indicating that 70.3% of the variance in Perceived Risk can be explained by Socio-Demography, Technology Innovation, and Environmental Concern. Meanwhile, the R^2 value for Purchase Intention is 0.706, meaning that 70.6% of the variance in Purchase Intention is explained by Perceived Risk, Socio-Demography, Technology Innovation, and Environmental Concern. Both results fall within the substantial range, suggesting that the model has a strong explanatory capability.

Predictive relevance assesses the extent to which a model can predict the data of endogenous constructs. According to Hair et al. (2022), a Q^2 value greater than 0 confirms that the model has predictive relevance, while values above 0.25 and 0.50 are considered to represent medium and large predictive accuracy, respectively.

Table 7. Predictive Relevance (Q^2)

	Q-square Predict	Result

Perceived Risk (PR)	0.696	Good predictive relevance
Purchase Intention (PI)	0.673	Good predictive relevance

As shown in Table 7, the Q^2 value for Perceived Risk (Z) is 0.696, and for Purchase Intention (Y) is 0.673. Both values are substantially higher than zero, indicating that the model has strong predictive relevance for both endogenous variables. This result confirms that the model is not only statistically valid but also capable of accurately predicting future observations related to perceived risk and purchase intention in the context of electric vehicle adoption.

The f^2 (effect size) measures the impact of variables at the structural level, where f^2 values of 0.02, 0.15, and 0.30 correspond to small, medium, and large effects, respectively (Hair et al.,2022). Based on the calculation results using SmartPLS version 4.0, the f^2 effect size values obtained are presented in the table below.

Table 8. F-Square

	f-square	Result
Environmental Concern (EC) -> *Perceived Risk* (PR)	0.439	High
Environmental Concern (EC) -> *Purchase Intention* (PI)	0.219	Moderate
Perceived Risk (PR) -> *Purchase Intention* (PI)	0.089	Low
Socio-Demography (SC) -> *Perceived Risk* (PR)	0.011	-
Socio-Demography (SC) -> *Purchase Intention* (PI)	0.108	Low
Technology Innovation (TI) -> *Perceived Risk* (PR)	0.400	High
Technology Innovation (TI) -> *Purchase Intention* (PI)	0.040	Low

As presented in Table 8, the analysis reveals that Environmental Concern (EC) has a large effect on Perceived Risk (PR) with f-square value is 0.439. Similarly, Technology Innovation (TI) shows a large effect on Perceived Risk with f-square is 0.400. These results suggest that Environmental Concern and Technology Innovation are the most influential predictors in the model, particularly in shaping perceived risk. Meanwhile, the influence of Socio-Demography on both mediating and dependent variables is relatively limited.

The hypothesis testing in PLS-SEM aims to assess whether the relationships between latent variables are statistically supported by the data. Using the bootstrapping method in SmartPLS 4, the significance of each path is evaluated through t-statistics and p-values. A relationship is considered significant if $p < 0.05$ or if the t-statistic exceeds the critical value of 1.96. Conversely, if $p > 0.05$ or $t < 1.96$, the relationship is deemed non-significant. The results, presented in Table 9, enable researchers to determine which hypotheses are supported and whether the proposed structural model aligns with the empirical data.

Table 9. Hypothesis Result

Relation	Coefficient	T statistics	P values	Result
Direct Effect				
Environmental Concern (X3) -> Perceived Risk (Z)	0.479	7.706	0.000	Positive and Significant
Environmental Concern (X3) -> Purchase Intention (Y)	0.402	5.028	0.000	Positive and Significant
Perceived Risk (Z) -> Purchase Intention (Y)	0.296	3.185	0.001	Positive and Significant
Socio-Demography (X1) -> Perceived Risk (Z)	-0.060	1.195	0.232	Negative and No Significant

Socio-Demography (X1) -> Purchase Intention (Y)	-0.185	3.530	0.000	Negative and Significant
Technology Innovation (X2) -> Perceived Risk (Z)	0.441	7.231	0.000	Positive and Significant
Technology Innovation (X2) -> Purchase Intention (Y)	0.163	2.220	0.026	Positive and Significant
Indirect Effect				
Environmental Concern (X3) -> Perceived Risk (Z) -> Purchase Intention (Y)	0.141	2.808	0.005	Positive and Significant
Socio-Demography (X1) -> Perceived Risk (Z) -> Purchase Intention (Y)	-0.018	1.071	0.284	Negative and No Significant
Technology Innovation (X2) -> Perceived Risk (Z) -> Purchase Intention (Y)	0.130	2.958	0.003	Positive and Significant

Based on the research findings, a detailed discussion is provided for each proposed hypothesis. Each hypothesis is analyzed in-depth to clarify the relationships among the examined variables. This discussion systematically outlines the results of hypothesis testing, including coefficient values, levels of significance, and interpretations relevant to the theoretical framework and research context. Moreover, it explores potential factors influencing the outcomes, whether supporting or contradicting the initial predictions. This approach aims to provide a comprehensive understanding of the variable dynamics in this study and contribute valuable insights for theory and practice. The following sections present the analysis of each hypothesis.

Hypothesis 1. Socio-demography significantly influences the intention to purchase intention an EV A negative and significant relationship was found between socio-demography and purchase

intention (β = -0.185, t = 3.530, p = 0.000). It showed that economic diversity is high, residents from lower-income brackets or larger families may view EVs as financially inaccessible. This highlights that although interest exists, affordability and practicality remain major barriers, particularly for groups without stable income or with high household expenses.

This result supported by Manutworakit & Choocharukul (2022) found that socio-demographic characteristics influence electric vehicle purchase intention, although the impact varies across groups and variables. The study suggests tailoring EV promotion strategies to local demographic elements, such as targeting productive-age or urban consumers, to improve adoption effectiveness.

Hypothesis 2. Technology Innovation significantly influences the intention to purchase intention an EV

Innovation had a positive and significant effect on purchase intention (β = 0.163, t = 2.220, p = 0.026). Surabaya residents may be drawn to modern features such as smart dashboards, energy efficiency, or improved mileage. Despite concerns, innovation enhances the perceived value of EVs, particularly among urban consumers who seek performance and convenience in their mobility solutions.

This result supported by Xie et al. (2022) found that not all aspects of technology innovation significantly influence consumer decisions. While attributes like driving range and battery life showed a positive trend, they were not statistically significant. However, battery performance and performance expectation had a positive and significant effect on purchase

intention. The greater the consumer's trust in battery power and technical performance, the higher their intention to buy.

Hypothesis 3. Environmental concern significantly influences the intention to purchase intention an EV

Environmental Concern also had a positive and significant effect on purchase intention (β = 0.402, t = 5.028, p = 0.000). As Surabaya's growing environmental awareness, visible in increased public discourse around air quality, waste management, and green infrastructure. Environmentally conscious individuals are more likely to adopt electric vehicles as a proactive step toward personal and urban sustainability. Their intentions reflect both personal values and perceived contribution to solving the city's environmental challenges.

This result supported by Lee et al. (2021) found that environmental concern has a positive and significant effect on purchase intention. Defined as public awareness of environmental issues and the desire to contribute personally to solutions, environmental concern motivated consumers to choose low-carbon transport.

Hypothesis 4. Perceived Risk significantly influences the intention to purchase an EV

Perceived risk surprisingly had a positive and significant impact on purchase intention (β = 0.296, t = 3.185, p = 0.001). Surabaya consumers are aware of EV-related uncertainties such as charging availability or maintenance but view these as manageable risks. It reflects a calculated decision-making process, where informed consumers balance potential drawbacks against the broader benefits of EV adoption in a modern, high-density urban setting.

This result supported by Phua et al. (2024) found that perceived risk has a positive and significant influence on purchase intention for electric vehicles in Kuala Lumpur. Interestingly, perceived risk served as a motivator rather than a deterrent. Consumers who were already aware of potential risks such as price, charging infrastructure, and battery durability were more confident in making rational purchase decisions, indicating a readiness to adopt EVs despite acknowledged uncertainties.

Hypothesis 5. Socio-demography significantly influences perceived risk

Socio-demography showed a negative and non-significant effect on perceived risk (β = - 0.060, t = 1.195, p = 0.233), indicating that differences in income or family size in Surabaya do not strongly influence how people perceive EV risks. This may suggest that access to information and education—rather than demographic profile is more critical in shaping how Surabaya residents form risk perceptions related to new technologies.

This result supported by Kovács & Wolf (2024) found that socio-demographic variables do not consistently influence perceived risk toward electric vehicles. Their study showed that factors like gender, car ownership, and purchase intention were not significant predictors of perceived risk. This suggests that personal experience, technological understanding, and trust in innovation play a more critical role in shaping consumer risk perceptions than demographic background.

Hypothesis 6. Technology Innovation significantly influences perceived risk

Technology innovation significantly increased perceived risk (β = 0.441, t = 7.231, p = 0.000). In Surabaya, rapid technological change may trigger concern among consumers unfamiliar with EV systems or skeptical of long-term reliability. The complexity of EV batteries, apps, and smart features could create uncertainty, especially in segments with lower tech literacy. This shows that while innovation is exciting, it also introduces fear of the unknown.

This result supported by Yuk et al. (2025) found a significant relationship between technology innovation and perceived risk. As exposure to unfamiliar innovations increases, so does consumer uncertainty regarding safety, reliability, and long-term costs. The study highlights that without clear education and trust guarantees, innovation may heighten

perceived risk. Thus, providing technical clarity, warranties, and user experiences is essential to build consumer trust.

Hypothesis 7. Environmental Concern significantly influences perceived intention risk

Environmental concern had a positive and significant effect on perceived risk (β = 0.479, t = 7.706, p = 0.000). This suggests that respondents in Surabaya who are environmentally aware tend to be more cautious and critical when evaluating electric vehicles. As an urban area with visible pollution and traffic issues, Surabaya residents may be more attuned to sustainability but also more alert to the hidden risks behind new technology, such as battery disposal or electricity sources. Their concern for the environment leads them to examine whether EVs truly offer long-term ecological benefits.

This result supported by Butt & Singh (2023) found that consumers with high environmental concern tend to view risks such as cost, performance, or infrastructure as acceptable challenges rather than barriers. When environmental values are prioritized, these consumers are more likely to tolerate or overlook risks if the technology aligns with their sustainability goals. Thus, perceived risk is seen as a reasonable cost for contributing to environmental well-being.

Hypothesis 8. Perceived risk mediates the effect of socio-demography on purchase intention

This path was not significant (β = -0.018, t = 1.071, p = 0.284), meaning perceived risk does not mediate the relationship between socio-demography and purchase intention. In Surabaya, demographic traits may impact intention directly (through income or lifestyle), but do not shape how risks are interpreted. Instead, financial access or infrastructure familiarity may be more relevant factors.

This result supported by Cao (2023) found that socio-demographic factors such as age, income, and education level do not significantly affect purchase intention for electric vehicles. The study suggests that these variables are unreliable predictors of EV adoption. Instead, risk perception is more strongly influenced by non-demographic factors like personal experience with technology, trust in EV systems, and understanding of their benefits and complexity.

Hypothesis 9. Perceived risk mediates the effect of technology innovation on purchase intention

A positive and significant indirect effect was found (β = 0.130, t = 2.958, p = 0.003), confirming that perceived risk partially mediates the impact of innovation on intention. While innovation may raise concerns, its benefits still drive consumers toward adopting EVs.

This result supported by Thilina & Gunawardane (2019) found that technology innovation reflected in vehicle features, battery efficiency, and charging infrastructure impacts consumers' perceived usefulness and ease of use. Perceived risk acts as a significant mediator between these perceptions and purchase intention. Even when consumers find EV technology beneficial and convenient, their perceived risk still affects their likelihood to buy. High perceived usefulness helps them tolerate the risks involved.

Hypothesis 10. Perceived risk mediates the effect of environmental concern on purchase intention

The indirect path was positive and significant (β = 0.141, t = 2.808, p = 0.005), confirming partial mediation. Environmentally concerned individuals experience risk awareness but still proceed with intention to purchase. Risk acts as a cautious filter rather than a barrier.

This result supported by Zhen et al. (2025) explained that while environmentally concerned consumers tend to support electric vehicles, this attitude weakens if perceived risks—such as safety, performance, or after-sales service are high. Perceived risk plays a dual role: as a psychological barrier due to uncertainty and fears about EV use, and as a crucial indicator for companies and policymakers to identify factors limiting sustainable adoption.

CONCLUSION

Based on the research findings and the overall analysis conducted in this study on the factors influencing the purchase intention of electric vehicles in Surabaya, the conclusion reveals a multifaceted interaction among key variables. The study demonstrated that environmental concern and perceived risk significantly affect consumers' willingness to adopt electric vehicles, while technology innovation and socio-demographic variables have more nuanced or indirect roles. These findings suggest that policymakers and manufacturers should place greater emphasis on enhancing consumer awareness of environmental impact and reducing perceived risks through transparent communication and improved infrastructure.

The findings confirmed that both direct and indirect pathways significantly contribute to shaping consumers' behavioral intention to adopt EVs, reflecting a shifting paradigm in transportation preferences one that is increasingly shaped by sustainability values, technological perceptions, and cognitive evaluations of risk, rather than merely cost or demographic profiles.

The results reveal that environmental concern plays a critical and most dominant role in influencing purchase intention. This supports the premise that today's urban consumers are not only aware of environmental degradation but are also willing to engage in pro-environmental behavior through product choices, such as transitioning from conventional vehicles to EVs. In Surabaya where air quality issues, traffic congestion, and climate vulnerability are becoming more pressing the relevance of environmental concern is amplified. Individuals who feel a sense of responsibility toward environmental preservation are more inclined to support EV adoption, perceiving it not only as a personal gain but as a collective solution to public environmental challenges. Moreover, the indirect effect of environmental concern on purchase intention through perceived risk illustrates that environmentally motivated consumers tend to process risk cognitively rather than reactively they are likely to perceive challenges such as charging limitations or high initial costs as acceptable trade- offs for long-term ecological benefits.

Technology innovation, particularly in battery performance and overall vehicle functionality, is also a significant factor influencing both perceived risk and purchase intention. Consumers are increasingly responsive to the tangible improvements brought by innovation such as enhanced mileage, reduced charging times, and longer battery lifespan which shape their perception of product reliability and utility. In a growing urban economy like Surabaya, where mobility is a necessity and consumer expectations around product performance are rising, innovation becomes a key psychological lever in overcoming hesitation. However, the presence of a significant mediating effect through perceived risk suggests that innovation alone is not enough; consumers must be convinced that the new technologies are safe, proven, and supported by adequate infrastructure. Without strong messaging around warranties, service networks, and user experience, even advanced innovation may trigger concern. Thus, perceived risk acts as a gateway filter through which innovation must pass to effectively drive intention.

The study also uncovered an important finding regarding perceived risk, which unlike many previous studies that view it as a barrier here emerges as a significant and positive predictor of purchase intention. This may indicate a more rational and informed consumer segment in Surabaya, where individuals evaluate risks in balance with anticipated benefits. Rather than avoiding EVs due to uncertainty, many participants acknowledge potential risks but remain optimistic or strategic in navigating them. This result reflects the changing behavior of early adopters and sustainability- oriented consumers, who often accept manageable risks in pursuit of a larger ecological or technological goal. This is also consistent with behavioral economic perspectives, where individuals assign subjective value to risk depending on perceived gains, social influence, and personal goals.

In contrast, the analysis of socio-demographic factors—including age, income, family size, occupation, and education revealed no significant direct or indirect influence on either perceived risk or purchase intention. This is a critical insight for marketers and policymakers, as it implies that demographic segmentation may be insufficient to capture consumer motivations in the EV context. Urban consumers in Surabaya, regardless of age or socioeconomic status, appear to be influenced more by cognitive, affective, and contextual factors. This finding supports the view that targeting consumers based on environmental values, innovation openness, and trust in technology may be more effective than segmenting them based on static demographic traits.

Altogether, this study confirms that EV adoption is a complex, multidimensional behavior influenced by a synergy of concern for the environment, trust in innovation, and rational engagement with risk. It contributes to the academic understanding of sustainable consumption behavior in a developing urban context and offers practical direction for EV market development in Indonesia. It also underscores the growing maturity of Indonesian consumers particularly in cities like Surabaya in adopting global sustainability trends.

Implication

The findings of this study offer essential insights for policymakers, EV manufacturers, and sustainability advocates, especially within the urban context of Surabaya. First, the strong and significant effect of environmental concern on purchase intention highlights the urgency for public and private institutions to amplify awareness campaigns emphasizing environmental sustainability and the long-term ecological benefits of EVs. This aligns with the demographic traits of Surabaya residents, many of whom belong to working-age segments concerned with urban pollution and environmental quality.

Second, the positive influence of socio-demographic factors and technology innovation on perceived risk suggests that targeted information campaigns and technical demonstrations—such as test drives and educational exhibitions could demystify EV technologies, especially regarding battery performance and consumer's expectation. These interventions would reduce psychological and performance-related concerns and could be delivered through collaborations between EV producers and local governments.

Third, the significant mediating role of perceived risk between environmental concern and purchase intention implies that risk perception management must be embedded into EV promotional strategies. Guarantee programs, extended battery warranties, or government- endorsed certifications may help foster consumer trust. Given that nearly half of the respondents do not yet own a car, there is an untapped market segment that may be more receptive to transitioning directly to EVs, especially if initial barriers such as price and charging convenience are addressed.

Therefore, stakeholder collaboration is vital to establish charging networks in residential and commercial zones across Surabaya, ensuring accessibility for both current and prospective EV users. Lastly, government incentives such as tax breaks, parking privileges, and public transport integration schemes should be designed to appeal to environmentally

conscious and innovation-aware consumers groups shown to be significantly inclined toward EV adoption in this study.

Limitation and Suggestions for Future Research

Despite yielding meaningful insights, this study has several limitations that should be acknowledged. First, the research was conducted exclusively in the urban area of Surabaya, which limits the generalizability of the findings to other regions in Indonesia with differing socio-economic profiles, infrastructure development, or consumer awareness levels regarding electric vehicles (EVs). The sample may not fully capture the diversity of perceptions in rural or semi-urban contexts where environmental concerns and access to EV-related facilities may differ significantly.

Second, although socio-demographic variables were included, the construct showed low internal reliability, indicating that the measurement items (e.g., family size, income) may not adequately reflect the underlying behavioral segmentation needed for EV studies in Indonesia. This might have weakened its statistical power and explanatory potential, particularly in explaining perceived risk or intention.

Third, the use of a cross-sectional design restricts the ability to capture evolving consumer attitudes over time. Purchase intention is a dynamic construct that may change in response to external influences such as government regulations, fuel price fluctuations, infrastructure expansion, or technological breakthroughs.

Fourth, the model did not include moderating or contextual variables such as environmental knowledge, personal innovativeness, social influence, or government incentives, all of which could enrich the explanatory depth of consumer behavior in EV adoption. Without these factors, the model may understate the influence of social or policy-based dynamics.

As this study had a limitations, to build upon the present findings, future research is encouraged to expand the geographic scope to include participants from various regions across Indonesia, including rural and less urbanized areas. Comparative studies between metropolitan areas and smaller towns could uncover regional disparities in EV awareness, perceived risk, and purchase behavior. It is also recommended to improve the measurement instruments for socio-demographic constructs by incorporating more nuanced indicators such as vehicle usage patterns, environmental lifestyle orientation, and mobility constraints. This would allow for more meaningful segmentation and better identification of target consumer groups.

Furthermore, future studies could adopt a longitudinal approach to observe how consumer perceptions evolve over time, especially as EV infrastructure, product availability, and public policies continue to develop. Tracking behavioral shifts would provide more robust evidence for forecasting future market trends. Finally, integrating moderating variables such as trust in government policy, prior experience with technology, or environmental literacy could offer deeper insights into the mechanisms behind intention formation. A mixed-methods approach combining quantitative analysis with qualitative interviews may also reveal subtle psychological or cultural factors that influence EV adoption in the Indonesian context.

BIBLIOGRAPHY

Butt, M. H., & Singh, J. G. (2023). Factors affecting electric vehicle acceptance, energy demand and CO2 in Pakistan. *Green Energy and Intelligent Transportation*, *2*(3), 100081. https://doi.org/10.1016/j.geits.2023.100081

Cao, Y. (2023). *FIU Digital Commons Investigating the Factors Affecting Consumers Purchase Intention for Electric Vehicles (EVs)*.

Hair, J., & Alamer, A. (2022). Partial Least Squares Structural Equation Modeling (PLS-SEM) in second language and education research: Guidelines using an applied example. *Research Methods in Applied Linguistics*, *1*(3). https://doi.org/10.1016/j.rmal.2022.100027

Kartawinata, B. R., Pradana, M., Akbar, A., Trenggana, A. F. M., & Cahyaningrum, S. D. (2020). The effect of easy perception and risk of users of financial technology services in smes of bandung, indonesia. *Proceedings of the International Conference on Industrial Engineering and Operations Management*, *59*(2), 997–1007.

Kim, S., Choi, J., Yi, Y., & Kim, H. (2022). Analysis of Influencing Factors in Purchasing Electric Vehicles Using a Structural Equation Model: Focused on Suwon City. *Sustainability (Switzerland)*, *14*(8), 1–17. https://doi.org/10.3390/su14084744

Kovács, T., & Wolf, G. (2024). Electric vehicle adoption in Generation Z: Drivers of Hungarian higher education students' attitude. *Society and Economy*, *47*, 85–103. https://doi.org/10.1556/204.2024.00018

Kumar, R. R., & Alok, K. (2020). Adoption of electric vehicle: A literature review and prospects for sustainability. *Journal of Cleaner Production*, *253*, 119911. https://doi.org/10.1016/j.jclepro.2019.119911

Lashari, Z. A., Ko, J., & Jang, J. (2021). Consumers' intention to purchase electric vehicles: Influences of user attitude and perception. *Sustainability (Switzerland)*, *13*(12). https://doi.org/10.3390/su13126778

Lee, J., Baig, F., Talpur, M. A. H., & Shaikh, S. (2021). Public intentions to purchase electric vehicles in Pakistan. *Sustainability (Switzerland)*, *13*(10), 1–18. https://doi.org/10.3390/su13105523

Ling, Z., Cherry, C. R., & Wen, Y. (2021). Determining the factors that influence electric vehicle adoption: A stated preference survey study in Beijing, China. *Sustainability (Switzerland)*, *13*(21), 1–22. https://doi.org/10.3390/su132111719

Liu, R., Ding, Z., Jiang, X., Sun, J., Jiang, Y., & Qiang, W. (2020). How does experience impact the adoption willingness of battery electric vehicles? The role of psychological factors. *Environmental Science and Pollution Research*, *27*(20), 25230–25247. https://doi.org/10.1007/s11356-020-08834-w

Manutworakit, P., & Choocharukul, K. (2022). Factors Influencing Battery Electric Vehicle Adoption in Thailand—Expanding the Unified Theory of Acceptance and Use of Technology's Variables. *Sustainability (Switzerland)*, *14*(14). https://doi.org/10.3390/su14148482

Mohr, S., & Kühl, R. (2021). Acceptance of artificial intelligence in German agriculture: an application of the technology acceptance model and the theory of planned behavior. *Precision Agriculture*, *22*(6), 1816–1844. https://doi.org/10.1007/s11119-021-09814-x

Phua, K., An, C., & Kamaruddin, N. K. (2024). The Relationship between Perceived Benefit and Perceived Risk Toward Electric Vehicle (EV) Purchase Intention Among Consumers in Kuala Lumpur. *Research in Management of Technology and Business*, *5*(1), 346–364. https://publisher.uthm.edu.my/periodicals/index.php/rmtb

Roemer, E., & Henseler, J. (2022). The dynamics of electric vehicle acceptance in corporate fleets: Evidence from Germany. *Technology in Society*, *68*(June 2021). https://doi.org/10.1016/j.techsoc.2022.101938

Rogers. (2006). Detailed review of Roger's Diffusion of innovations theory and educational technology. *The Turkish Online Journal of Educational Technology*, *5*(2), 14–23. https://files.eric.ed.gov/fulltext/ED501453.pdf

Thilina, D., & Gunawardane, N. (2019). The effect of perceived risk on the purchase intention of electric vehicles: An extension to the technology acceptance model. *International*

Journal of Electric and Hybrid Vehicles, *11*(1), 73–83. https://doi.org/10.1504/ijehv.2019.098717

Veza, I., Abas, M. A., Djamari, D. W., Tamaldin, N., Endrasari, F., Budiman, B. A., Idris, M., Opia, A. C., Juangsa, F. B., & Aziz, M. (2022). Electric Vehicles in Malaysia and Indonesia: Opportunities and Challenges. *Energies*, *15*(7), 1–24. https://doi.org/10.3390/en15072564

Wang, X. W., Cao, Y. M., & Zhang, N. (2021). The influences of incentive policy perceptions and consumer social attributes on battery electric vehicle purchase intentions. *Energy Policy*, *151*(July 2020). https://doi.org/10.1016/j.enpol.2021.112163

Xie, R., An, L., & Yasir, N. (2022). How Innovative Characteristics Influence Consumers' Intention to Purchase Electric Vehicle: A Moderating Role of Lifestyle. *Sustainability (Switzerland)*, *14*(8), 1–24. https://doi.org/10.3390/su14084467

Yuk, H., Hwang, E., Garrett, T. C., & Lee, J. H. (2025). The Paradox of Customer Participation: The Role of Perceived Risk in Technology-Based Innovation. *International Journal of Consumer Studies*, *49*(3), 1–17. https://doi.org/10.1111/ijcs.70062

Zhang, X., Bai, X., & Shang, J. (2018). Is subsidized electric vehicles adoption sustainable: Consumers' perceptions and motivation toward incentive policies, environmental benefits, and risks. *Journal of Cleaner Production*, *192*, 71–79. https://doi.org/10.1016/j.jclepro.2018.04.252

Zhen, X., Nerina, R., Yusof, R., & Ali, M. H. (2025). *The Role of Perceived Risk and Environmental Concern in Consumers ' Online Purchase Intention of Electric Cars in China*. *15*(2), 1218–1235. https://doi.org/10.6007/IJARBSS/v15-i2/24703