

UNDERSTANDING OF CONSUMER BEHAVIOR TOWARD ENVIRONMENTAL SUSTAINABILITY ON ELECTRIC VEHICLE PURCHASE INTENTIONS IN INDONESIA

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Abstract:

Background: Indonesia is currently facing a significant problem of air pollution caused by vehicle emissions, which severely impacts both health and the economy. With the depletion of natural resources, the cost of gasoline is on the rise.

Purpose: To address this issue, a study was conducted to investigate consumer behavior and their awareness of environmental sustainability when purchasing electric vehicles.

Design/methodology/approach: A purposive sampling method was used, and the survey was conducted on 140 individuals who own fossil fuel-powered vehicles. The research utilized Smart PLS for data processing.

Findings/Result: The results confirmed two hypotheses and refuted two based on prior research. **Conclusion:** Findings indicate environmental awareness, but barriers to EV adoption persist.

Originality/value (State of the art): Adds new evidence on EV purchase decisions in emerging markets.

Keywords: environmental concern, attitude, subjective norm, behavior control, electric vehicle purchase intention



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INTRODUCTION

Indonesia holds the unenviable distinction of being the most polluted country worldwide, according to the IQAir 2021 World Air Quality report published in March 2022, with a PM_{2.5} concentration of 34.3 µg/m³. The country is leading Southeast Asia in air pollution levels, with the primary contributor being the combustion of fossil fuels, especially in transportation (detik.com, 2022). The Indonesian National Police recorded a staggering 152.51 million motorized vehicles in the country as of December 31, 2022. Motorcycles constitute the majority of vehicles, with 126.99 million units, accounting for 83.27% of total sales, and passenger vehicles constitute 19.31 million units, representing 12.5% of the total. Despite a slight decline in automotive sales in November 2022, with 91,086 units sold domestically, the electric vehicle market in Indonesia continues to trail the fossil fuel vehicle market (Ahdiat, 2023). The Indonesian automotive sector is facing complex challenges as the government tries to promote electric vehicle usage, while fossil fuel vehicle sales continue to grow annually. The higher cost of electric vehicles limits their appeal primarily to affluent consumers, which contributes to the limited adoption of electric vehicles (Syamnur et al. 2019).

Electric vehicles are expected to have higher environmental sustainability. It is because the vehicle's movement is driven by electricity. According to Tan et al. (2017) and Gaspar and Antunes (2011), the machine emits no remaining CO₂ (carbon dioxide) or CO (carbon monoxide). Another advantage is the existence of air pollution, which can exacerbate the greenhouse effect and global warming. Both carbon dioxide and carbon monoxide harm human health. This condition, among other causes, will impair the blood's ability to bind oxygen, causing a variety of organ dysfunctions in the body.

Deploying electric-powered vehicles (EBV) and other environmentally friendly vehicles has met opposition in this country (Syamnur et al. 2019). The growing demand for the latest generation of combustion engine-based vehicles (CBV), mainly passenger cars, is unavoidable, given the convenience they provide to their customers. Erahman et al. (2019) investigated the association between mobility and psychological demands in urban and rural environments. Offering eco-friendly car products is recommended as a superior approach. Nonetheless, the task is difficult due to the

relatively high cost of entering the Indonesian market, which is determined by unique market characteristics that differ from those seen in industrialized countries (Deb et al. 2019 and Gonul et al. 2021). The issue at hand is marketing and increasing public acceptance of eco-vehicle products in Indonesia to make them more appealing to Indonesian buyers. As a result, this study aims to investigate the factors contributing to consumers' disinterest in purchasing electric vehicles. The investigation delves into the psychological drivers behind the widespread adoption of electric vehicles domestically.

Numerous studies have been conducted in various countries to investigate the same topics, utilizing both the Theory of Planned Behavior (TPB) and Extended Theory of Planned Behavior (ETPB) frameworks (Javid et al. 2022). Scholars often employ the TPB to predict consumer Expected Value of Perfect Information (EVPI) based on behavioral trends (Tuncel, 2022; Li et al. 2019). The TPB framework delineates the factors that influence individuals' decision-making process and behavior, and it proposes that attitudes (AT), subjective norms (SN), and perceived behavioral control (PBC) collectively influence individual behavioral decisions. Based on this paradigm, individuals consciously weigh potential benefits and drawbacks before acting (Ajzen, 1991). Consequently, TPB is a tool to forecast Consumer EVPI (Ajzen, 1991). Recent studies suggest integrating environmental concerns and changes in consumers' perceptions of EVPI into the traditional TPB framework (Javid et al. 2022; Wu et al. 2021). By incorporating these elements, the TPB framework's applicability in analyzing consumer behavior toward adopting and purchasing electric cars (EVs) can be enhanced. This study assesses consumer behavior regarding their intention to purchase an electric vehicle. It examines the roles of environmental concerns, attitudes, subjective norms, and behavior control, which are believed to impact their intention.

METHODS

In January 2023, a research study was conducted in Indonesia, covering the five most populous islands: Java, Sumatra, Sulawesi, Kalimantan, and Bali. The research design was descriptive with a quantitative approach, and the data utilized included primary and secondary sources. The primary data collection utilized a survey method, employing questionnaires distributed

to chosen respondents via Google Forms. This survey was conducted online through various social media platforms such as WhatsApp. Secondary data was gathered from literature studies from books, websites, articles, and journals. For the study, purposive sampling was used, where the population under investigation consisted of the entire population residing on the five islands mentioned above, which totaled 256 million people. The number of respondents required was five times the number of questionnaires, which amounted to 140 individuals (Hair et al. 2010). The primary criterion for selecting respondents was ownership of a fossil fuel vehicle. The research hypotheses underwent testing through path analysis. This approach facilitated the identification of both direct and indirect effects, providing a comprehensive understanding of the relationships among variables. This method also served as an indicator for assessing validity and reliability. The research data underwent analysis utilizing Partial Least Squares (PLS) with SMART PLS Ver 3.0 software, enabling robust examination and interpretation of the findings.

Environmental Concern is a belief, stance, and level of Concern held by an individual towards the environment. Research has widely acknowledged the significance of emotional responses as a crucial determinant of ecological behavioral intentions (Chen & Hung, 2016). In green product adoption, studies suggest that individuals' emotional connection to environmental issues and their sense of personal responsibility towards environmental protection are closely associated with heightened environmental Concern, subsequently leading to the adoption of green products (Verma & Chandra, 2016). It is argued that the emotional component is pivotal in influencing individuals' intentions to engage in environmentally friendly behaviors, including green purchasing (Lai et al. 2015).

Individuals demonstrating heightened Environmental Concern (EC) often prioritize environmental conservation and are inclined to embrace eco-friendly products, such as Electric Vehicles (EVs) (Lee et al. 2021). However, there is limited research on this relationship, especially in studies focusing on EVs as green products (Wang, 2017 and Rizkiatami et al. 2023). Ozaki and Sevastyanova (2010) found a positive correlation between consumer EC and the Expected Value of Perfect Information (EVPI), while a study conducted in Germany confirmed that individuals with

a heightened sense of environmental responsibility are more willing to invest in electric or hybrid vehicles (Achtnicht, 2017). However, there is a need for more research to investigate this relationship in an Indonesian context. Based on existing literature suggesting that EC may significantly impact EV adoption, we propose the following hypothesis 1: Environmental Concerns positively and significantly influence electric vehicle purchase intentions.

A consumer's attitude is paramount as a predictor of behavior within psychology (Waris & Ahmed, 2020). It constitutes a fundamental construct of the Theory of Planned Behavior (TPB) by Ajzen (1985), representing the individual's favorable or unfavorable evaluation of a behavior (Klockner, 2013). Individuals with positive attitudes toward a particular action are more inclined to engage in that behavior. Previous studies have consistently shown a significant correlation between attitude and purchase intention in diverse domains, including green products (Nekmahmud & Fekete Farkas, 2020). Attitudes toward the environment directly influence pro-environmental behavior (Hasan et al. 2019). In the context of energy-efficient products, attitude exhibits a significant positive association with consumers' purchase intentions (Tan et al. 2017). Previous studies have examined the disparities in attitudes towards Electric Vehicles (EVs) between individuals with positive and negative perceptions. Research outcomes suggest that individuals with positive attitudes are more predisposed to purchasing Electric Vehicles (EVs) and are willing to pay a premium compared to conventional vehicles (Hidrué et al. 2011; Egbu & Long, 2012). Drawing from this existing evidence, we define attitude as pivotal in evaluating consumers' Expected Value of Perfect Information (EVPI). Consequently, we posit hypothesis 2: Attitude positively and significantly influences electric vehicle purchase intention.

Subjective norm refers to individuals' Concern for environmental expectations prior to engaging in behaviors, thereby subjecting them to social pressures (Wang et al. 2016; Kurniawan et al. 2024). Research conducted by Javid et al. (2022) revealed that subjective norm has a 1% effect on consumers' Expected Value of Perfect Information (EVPI) in China. Similarly, research conducted in India has highlighted subjective norms influencing the adoption of electric vehicles (EVs) (Shalender & Sharma, 2021). In general, research within the Theory of Planned Behavior (TPB)

framework has noted a positive association between perceived social pressure and behavioral performance (Shalender & Yadav, 2018). Nonetheless, the influence of subjective norms on behavioral intention remains a subject of contention, with certain studies indicating no significant effect (Yadaf et al. 2019; Chen & Hung, 2016).

Consequently, the influence of subjective norms on EV adoption, a green product, remains ambiguous. Intentions. To bridge this gap in the literature and fulfill the research objectives, we intend to investigate the influence of subjective norms on EV adoption in Indonesia. Building on previous research demonstrating a positive effect, we view subjective norms as a critical factor shaping consumers' EVPI. We propose hypothesis 3: Subjective norm positively and significantly impacts electric vehicle purchase intentions.

As per Dutta and Hwang (2021) and Adu et al. (2022), Perceived Behavioral Control (PBC) encompasses the range of factors that influence individuals' considerations when engaging in a specific behavior, reflecting their overall assessment of its ease or difficulty. Research by Wang and Yan (2015) has examined the influence of PBC on consumers' Electric Vehicle (EV) purchases, with subsequent studies reaffirming this association. Moreover, investigations into EV adoption consistently identify PBC as an indicator of consumers' pro-environmental behavior (Yadav & Pathak, 2016). However, the traditional Theory of Planned Behavior (TPB) model predominantly emphasizes the direct influence of perceived behavior control (PBC) on behavioral intention, with only a few studies investigating this relationship within the context of EV adoption. For instance, Egbue and Long (2012) identified PBC as the most vital determinant of Purchase intentions for Battery Electric Vehicles (BEVs) in Norway. Similarly, a study in India highlighted a significant correlation between PBC and EV adoption (Shalender et al. 2021). Thus, we conceptualize PBC as a predictor of the Expected Value of Perfect Information (EVPI). Accordingly, we propose hypothesis 4: Perceived behavior control significantly and positively impacts intentions to purchase electric vehicles. From the results of the literature review and hypotheses, the research framework is presented in Figure 1.

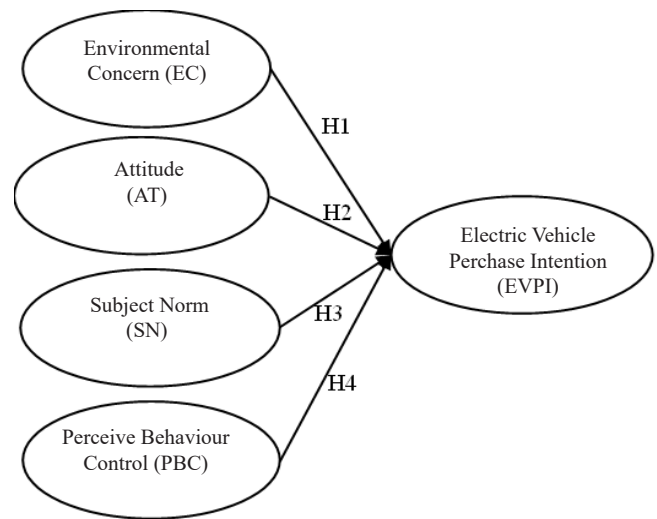


Figure 1. Research Models

RESULTS

Respondent characteristics

Based on the distribution of respondents, the following results were obtained based on age; among the respondents, the age group of 21 - 30 years constituted the most significant proportion (46.43%), followed by the age group of 41 - 50 years (25.71%), and those over 50 years old (16.4%). Additionally, the age groups of 17 - 20 years and 31 - 40 years accounted for 7.86% and 3.57% of the respondents, respectively. Regarding gender distribution, men outnumber women, comprising 56.43% and 43.57% of the respondents, respectively. Regarding educational attainment, the majority holds a bachelor's degree (55.71%), followed by those with postgraduate education (24.29%), high school graduates (8.57%), diploma holders (7.14%), and a minority with doctoral degrees (4.29%). Geographically, the majority of respondents reside on the island of Java (56.43%), followed by Sumatra (19.29%), Sulawesi (10.71%), Kalimantan (8.57%), and Bali (5%). In general, the respondents are characterized by their maturity in decision-making and strong educational backgrounds.

Measurement Model Assessment (outer loading)

Convergent validity

The Smart-PLS software evaluates the convergent validity of a latent variable's indicators. The assessment is done by analyzing the loading factor values obtained from the PLS Algorithm. The loading factor indicates the correlation between the constituent items and the latent variable. In this case, items with a loading factor

less than 0.50 are considered invalid, while those with a loading factor greater than 0.50 are considered valid. Based on this analysis, the research's convergent validity findings are summarized below.

Table 1 displays the essential output loading factor (LF) values for various variables and their corresponding measurement indicators. For instance, the Attitude variable is represented by three indicators: AT1= 0.648, AT2= 0.638, AT3= 0.949. The Environmental variable Concern, also with three measurements, is denoted by EC1 = 0.664, EC2 = 0.626, and EC3 = 0.694. Similarly, the Electric Vehicle Purchase Intention variable, with three indicators, is shown as EVPI1 = 0.534, EVPI2 = 0.826, and EVPI3 = 0.825. The Perceived Behavior Control variable, with four indicators, is indicated as PBC1=0.66, PBC2=0.709, PBC3=0.606, PBC4=0.746. Lastly, the Subject Norm variable, with three indicators, is represented as SN1=0.674, SN2=0.814, and SN3=0.706. The table provides clear evidence that every question asked in the questionnaire used in this study was successfully retrieved, with a loading factor value exceeding the significant threshold of 0.5. This robust outcome highlights the reliability and validity of the questions used in this investigation, indicating their commendable ability to explain the construct.

Table 2 shows the square root of the AVE values for various constructs. Attitude and Electric Vehicle Purchase Intention have an AVE value of 0.759 and 0.742, respectively. Environmental Concern, Perceived Behavior Control, and Subjective Norm correlate strongly with other constructs. According to the Fornell-Larcker criterion, which compares the square root of the AVE values with the correlations among latent variables, all variables exhibit discriminant validity. This means that each variable is unique and distinct from the others. Based on the table, all entries are considered valid. This conclusion can be supported by referring to Table 3, where indicators AT1, AT2, and AT3 are highlighted in bold. The construct's loading value is higher than other constructs' loading values. Similarly, other indicator variables such as EC1, EC2, EC3, EVPI1, EVPI2, EVPI3, PBC1, PBC2, PBC3, PBC4, SN1, SN2, and SN3, all have a loading value higher than the other constructs. This means that all constructs have good discriminant validity.

Table 1. Factors Loading

Variable	Indicator	Outer Loading	Validity
Attitude (AT)	AT1	0.648	Valid
	AT2	0.638	Valid
	AT3	0.949	Valid
Environmental Concern (EC)	EC1	0.664	Valid
	EC2	0.626	Valid
	EC3	0.964	Valid
Electric Vehicle Purchase Intention (EVPI)	EVPI1	0.534	Valid
	EVPI2	0.826	Valid
	EVPI3	0.825	Valid
Perceive Behaviour Control (PBC)	PBC1	0.66	Valid
	PBC2	0.709	Valid
	PBC3	0.606	Valid
	PBC4	0.746	Valid
Subject Norm (SN)	SN1	0.674	Valid
	SN2	0.814	Valid
	SN3	0.706	Valid

Table 2. Fornell-Larcker Criterion

	AT	EC	EVPI	PBC	SN
AT	0.759				
EC	0.097	0.742			
EVPI	0.081	0.301	0.766		
PBC	0.016	0.206	0.327	0.682	
SN	-0.121	0.167	0.544	0.246	0.734

Note: Attitude (AT); Environmental Concern (EC); Electric Vehicle Purchase Intention (EVPI); Perceive Behaviour Control (PBC); Subject Norm (SN)

Table 3. Cross Loading

	AT	EC	EVPI	PBC	SN
AT1	0.648	-0.008	0.036	-0.12	-0.129
AT2	0.638	-0.001	0.017	-0.078	-0.136
AT3	0.949	0.106	0.108	0.073	-0.089
EC1	0.061	0.664	0.108	0.295	0.608
EC2	0.156	0.626	0.065	0.033	0.346
EC3	0.056	0.964	0.342	0.324	0.445
EVPI1	0.029	0.102	0.534	0.138	0.042
EVPI2	0.105	0.208	0.826	0.167	0.092
EVPI3	0.07	0.306	0.825	0.16	0.194
PBC1	-0.152	0.206	0.145	0.66	0.13
PBC2	-0.034	0.255	0.093	0.709	0.307
PBC3	0.059	0.091	0.072	0.606	0.004
PBC4	0.138	0.281	0.192	0.746	0.199
SN1	0.031	0.635	0.131	0.319	0.674
SN2	-0.157	0.213	0.143	0.071	0.814
SN3	-0.213	0.342	0.051	0.146	0.706

Note: Attitude (AT); Environmental Concern (EC); Electric Vehicle Purchase Intention (EVPI); Perceive Behaviour Control (PBC); Subject Norm (SN)

Structural model assessment

R-square value

A higher R-squared value indicates greater predictive accuracy, ranging from 0 to 1. According to Chin's criteria (Ghozali & Latan, 2015), R-squared values of 0.67, 0.33, and 0.19 represent strong, moderate, and weak explanatory power, respectively. From the output of the analysis using the bootstrapping method, the R-squared value for the electric vehicle purchase intention variable is 0.109; it can be concluded that the influence of the Environmental concern variable, attitude variable, perceived behavioral control variable, Subject Norm on Attitude is 10.9% included in the weak category and explained that there were still many unobserved factors in research that influenced consumers' intention.

Path Coefficient (Inner Models)

Structural model estimation involves analysis through several tests, including Beta estimation and hypothesis assessment using t-values derived from the bootstrap process. A bootstrap with a subsample of 500 was conducted to enhance the statistical significance of item weights, following statistical guidelines (Cheah et al. 2018).

The results of the hypotheses testing presented in Table 4 can be interpreted as follows: The Attitude variable does not significantly influence Electric Vehicle Purchase Intention, as indicated by the t-statistic of 0.459, which falls below the critical value of 1.96, and the p-value of 0.323, exceeding the significance level of 0.05. Conversely, the Environmental Concerns variable demonstrates a notable positive impact on Electric Vehicle Purchase Intention, with a t-statistic

value of 2.071, surpassing the critical value of 1.96, and a p-value of 0.019, below the significance level of 0.05. Similarly, the Perceived Behavior Control variable positively influences Electric Vehicle Purchase Intention. However, the Subjective Norm variable does not significantly impact Electric Vehicle Purchase Intention, as evidenced by the t-statistic value of 0.195, falling below the critical value of 1.96, and a p-value of 0.423, exceeding the significance level of 0.05. Top of Form

The findings of this study are intriguing, revealing a significant favorable influence of environmental concern and perceived behavior control on Electric Vehicle Purchase intention. These results are consistent with previous research conducted by Lee et al. (2021), Wang (2017). However, the effect of attitude and subjective norm factors on the desire to acquire electric vehicles did not exhibit a statistically significant distinction. This discovery reinforces the research findings of Yadaf et al. (2019) and Chen and Hung (2016), who suggested that social norms have little or no impact on people's intentions to behave in a certain way.

This study reveals that people in Indonesia still need to be encouraged to use electric vehicles actively, as fossil fuel vehicles are more prevalent. Furthermore, many Indonesians consider electric vehicles to be a luxury item. However, the study found that people are already aware of the importance of addressing environmental issues, specifically pollution caused by emissions, and are willing to exert self-control when they intend to purchase electric vehicles. This highlights the need for the industry and government to prioritize this matter. The research successfully sheds light on Indonesian society's current state of affairs regarding the intention to purchase electric vehicles.

Table 4. Hypothesis testing

Hypothesis	Original sample (O)	T-statistics (O/STDEV)	P values	S/NS
Attitude → Electric Vehicle Purchase Intention	0.072	0.459	0.323	NS
Environmental Concern → Electric Vehicle Purchase Intention	0.234	2.071	0.019	S
Perceived Behavior Control → Electric Vehicle Purchase Intention	0.151	1.728	0.042	S
Subject Norm → Electric Vehicle Purchase Intention	0.021	0.195	0.423	NS

Noted: S=Significant, NS=Not Significant

Managerial Implication

This study underscores the significant impact of environmental concerns and perceived behavior control on the intention to purchase electric vehicles in Indonesia, indicating a promising future for electric cars. However, the data also reveals that personal attitudes and norms have minimal influence on the intention to purchase an electric vehicle. This suggests that individuals are largely influenced by their social environment. Therefore, stakeholders need to actively expedite the development of electric vehicle infrastructure to facilitate a smooth transition from fossil fuel to electric vehicles. Additionally, widespread advocacy is necessary to persuade the broader community that adopting electric vehicles is a sensible decision for health and environmental sustainability, thus maintaining equilibrium in human civilization.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The findings from hypothesis testing indicate that Environmental concern significantly influences electric vehicle purchase intentions in a positive direction. Likewise, Perceived behavior control positively and substantially impacts electric vehicle purchase intentions. However, neither the Attitude nor the Subjective Norm variables significantly influence the intention to purchase electric vehicles. The conclusions drawn from this research are not just attractive, but they also underscore the urgency of the situation. Despite the high awareness of sustainability and reasonable behavior control among prospective users of electric vehicles, there are still significant issues, particularly related to attitudes and subjective norms. It necessitates immediate attention from stakeholders to change the community paradigm regarding vehicle use. The comparison of electricity to fossil-fuelled vehicles further highlights the pressing need for action.

Recommendations

It is crucial for stakeholders, including the government as a regulator and the industry, to make significant advancements in establishing excellent facilities, infrastructure, and policies. These efforts aim to change the public's perception of electric vehicles, particularly their cost, service, and product excellence.

Given Indonesia's vast size, it is imperative to have vehicles that can travel great distances. Furthermore, developing infrastructure for electricity supply needs to be a significant priority, alongside the pressing issue of the current high prices. On the other hand, the government should offer incentives to electric vehicle owners to gradually shift their perception that electric cars are superior to conventional automobiles.

Future research should investigate additional variables related to EV purchase intentions that this study has yet to examine, such as price, after-sales service, and brand considerations. These variables are believed to significantly influence the decision to transition from conventional to electric vehicles. Understanding these variables and their impact on consumer perception and behavior can be achieved by adapting to specific circumstances.

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