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Factors Influencing Attitudes and Purchase Intentions of Electric Vehicles Among Urban Consumers

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ABSTRACT

Transitioning to electric vehicles (EVs) is crucial for sustainable transportation. This study investigates the factors influencing consumers' attitudes and purchase intentions toward EVs in Indonesia. Using a quantitative approach, data were collected from 400 respondents through an online survey, and Partial Least Squares Structural Equation Modeling (PLS-SEM) was employed for analysis. The findings indicate that performance expectancy, environmental concern, charging infrastructure, and financial incentives positively impact attitudes toward EVs, whereas price and operating costs are significant barriers. Attitude toward EVs is confirmed as a key mediator, linking these factors to purchase intention. The results suggest that improving EV infrastructure, reducing perceived costs, and increasing public awareness through education and incentives can enhance adoption rates. Policymakers and industry stakeholders should focus on strategic initiatives that address affordability, charging accessibility, and technological advancements to accelerate EV market growth. While this study offers valuable insights, future research should explore regional disparities and additional determinants such as brand perception and social influence. Indonesia can move toward a more sustainable transportation ecosystem by fostering a more favorable perception of EVs.

1. INTRODUCTION

The global shift towards electric vehicles (EVs) is driven by increasing environmental concerns, government regulations, and technological advancements in the automotive industry [1]. As part of the effort to reduce greenhouse gas emissions and fossil fuel dependency, many countries have implemented policies to promote EV adoption [2]. Indonesia, as the largest automotive market in Southeast Asia, has started to embrace this transition, with the government issuing Presidential Regulation No. 55/2019 to accelerate the development of EV infrastructure, battery production, and consumer incentives [3]. However, despite these efforts, EV adoption in Indonesia remains significantly lower compared to other countries with similar economic growth and automotive industry potential [4].

Compared to developed nations where EV penetration has seen remarkable growth, the Indonesian market is still in its early adoption phase, facing challenges such as high vehicle costs, lack of charging infrastructure, and low public awareness [5]. While the Indonesian government has introduced various initiatives, including tax reductions and investment in charging stations, the response from consumers remains limited [6]. Understanding the factors influencing consumers' attitudes and purchase intentions towards EVs in Indonesia is crucial for ensuring the success of these policies and promoting a sustainable transportation ecosystem.

This study makes a unique contribution by focusing on the Indonesian context as a representative case of EV adoption challenges in emerging economies. Unlike many prior studies on developed markets, this research explores how economic, infrastructural, and behavioral factors interact in a rapidly growing but infrastructure-limited environment. The findings fill a gap in EV adoption literature in Southeast Asia and offer practical implications for policymakers seeking to accelerate adoption in comparable settings.

Several studies have explored consumer adoption of EVs, primarily focusing on factors such as environmental awareness, performance expectancy, charging infrastructure, and financial incentives [7, 8]. However, most existing research is concentrated on developed markets, with limited studies examining emerging economies like Indonesia, where socio-economic conditions, infrastructure, and government incentives differ significantly [9]. Moreover, while theories such as Theory of Planned Behavior (TPB) and Unified Theory of Acceptance and Use of Technology (UTAUT) have been widely applied in studying EV adoption, their applicability in developing nations with infrastructure constraints and high price sensitivity remains underexplored [10, 11]. Previous research has demonstrated the importance

of factors such as environmental concern and financial incentives in shaping consumer behavior towards EVs, yet their relative influence within the Indonesian urban consumer segment is still unclear [12]. Additionally, charging time and availability of charging networks have been recognized as barriers in global studies, but their impact on Indonesian consumer preferences requires further examination [13].

Indonesia is one of the fastest-growing automotive markets in Asia, with a population exceeding 270 million and a rising middle class [14]. However, the country remains highly dependent on conventional internal combustion engine (ICE) vehicles, contributing to air pollution and increasing fuel consumption [15]. The government has acknowledged the importance of shifting towards sustainable mobility, yet the EV market is still struggling due to several barriers, including limited charging infrastructure, high upfront costs, unclear policy implementation, and lack of public awareness. The availability of public EV charging stations remains insufficient, especially outside major cities [16]. Additionally, the price of EVs in Indonesia remains significantly higher than conventional vehicles, discouraging price-sensitive consumers [17]. Although incentives exist, their effectiveness and accessibility to consumers remain questionable [18]. Moreover, many consumers still lack sufficient knowledge regarding EV benefits, operational costs, and environmental advantages [19].

Addressing these challenges requires a deeper understanding of consumer behavior specific to Indonesia's urban population, where the potential for EV adoption is highest due to better access to infrastructure, income levels, and exposure to green technology. This study provides an evidence-based analysis of what drives or inhibits consumer willingness to adopt EVs in this critical demographic.

While government initiatives aim to address these challenges, consumer responses remain lukewarm, indicating a gap between policy interventions and market adoption [20]. Thus, understanding what factors influence consumers' attitudes and purchase intentions in the Indonesian market is essential for devising effective strategies to boost EV adoption.

Accordingly, this study addresses the following refined research questions: (1) What key psychological and contextual factors influence urban Indonesian consumers' attitudes toward EVs? (2) How do these attitudes affect their intention to purchase EVs? (3) To what extent do specific factors, such as environmental concern, performance expectancy, infrastructure availability, vehicle pricing, operational costs, and incentives, impact consumer decision-making? (4) Do consumers' attitudes mediate the relationship between these influencing factors and purchase intentions?

The study aims to close a knowledge gap in EV adoption research in emerging markets and, by answering these focused questions, inform future public policy, marketing strategy, and product development initiatives.

Based on the phenomenon discussed above, several key questions emerge regarding EV adoption in Indonesia: What are the key factors influencing consumers' attitudes towards EVs in Indonesia? How do consumers' attitudes shape purchase intentions for EVs? To what extent do charging infrastructure, vehicle price, operational costs, and government incentives affect consumer decision-making [21]? Does environmental concern act as a mediator between consumer perceptions and purchase intention [22]? The limited adoption of EVs in Indonesia highlights the need to investigate these factors systematically, particularly within urban consumer demographics, where EV adoption has the highest potential due to higher awareness and better infrastructure access [23].

This study aims to provide a comprehensive analysis of the factors influencing EV adoption among Indonesian urban consumers. Specifically, it seeks to examine the impact of environmental concern and performance expectancy on consumers' attitudes towards EVs [24]. It also aims to analyze the influence of charging infrastructure, pricing, operational costs, and financial incentives on EV purchase intention [25]. Additionally, the study will assess the mediating role of consumers' attitudes in shaping EV adoption decisions [7]. Finally, it will provide policy and marketing recommendations to accelerate EV adoption in Indonesia [26]. This research is positioned to offer practical solutions to Indonesian transportation sustainability goals while enriching theoretical discourse on EV adoption in socio-economically diverse contexts.

2. LITERATURE REVIEW

This section reviews the existing literature on the factors influencing electric vehicle (EV) adoption, particularly focusing on environmental awareness, performance expectancy, charging infrastructure, financial incentives, and cost considerations. The review is structured based on key theoretical frameworks and empirical findings relevant to EV adoption, with a focus on the Indonesian market.

2.1 Theoretical frameworks on EV adoption

Several established theories have been applied to understand consumer behavior towards EV adoption. The TPB by Ajzen [10] is widely used to explain the relationship between attitudes, subjective norms, perceived behavioral control, and purchase intentions. Studies indicate that consumers' attitude toward EVs, influenced by their environmental concerns and perceived benefits, significantly impacts purchase intention [7, 22].

Additionally, the UTAUT by Venkatesh et al. [11] provides insights into how performance expectancy, effort expectancy, social influence, and facilitating conditions shape consumer adoption of EVs. These two theoretical models are highly relevant to EV adoption in Indonesia. TPB helps frame how individual beliefs, such as environmental concerns and economic considerations, influence consumers' attitudes in a culturally and economically diverse setting. Meanwhile, UTAUT provides a structured lens to analyze how enabling conditions such as charging infrastructure and perceived effort interact with consumer expectations in a technologically transitioning market. Integrating both frameworks allows for a holistic assessment of psychological and contextual drivers of EV adoption, especially in urban Indonesia, where policy, infrastructure, and awareness are still evolving.

While TPB has often been used in Western contexts to examine individual decision-making, its application here underscores how attitudes in an emerging market like Indonesia are deeply intertwined with perceived risks and barriers. Similarly, UTAUTs emphasis on facilitating conditions becomes particularly salient when infrastructure and institutional support are limited. Therefore, this study not only applies but also extends the utility of these models in

capturing the nuanced dynamics of EV adoption in a developing country.

2.2 Research gap in the Indonesian context

While substantial research has investigated EV adoption in developed countries, relatively limited empirical attention has been given to emerging economies like Indonesia, where the interplay between technology, policy, and socioeconomic conditions is more complex. Most existing research examines EV adoption in high-income markets with well-developed infrastructure, high environmental awareness, and strong purchasing power [9]. In contrast, Indonesia exhibits distinct challenges, low public awareness, price sensitivity, and uneven infrastructure distribution, which require context-specific analysis.

This study addresses a significant gap by applying TPB and UTAUT to assess urban Indonesian consumers' adoption behavior within these constraints. It contributes to the growing but still underdeveloped body of literature on sustainable transportation in emerging markets and highlights how these widely used theories perform when tested against the realities of limited incentives, infrastructural deficits, and evolving public perception.

2.3 The influence of environmental concern on attitude

Environmental concern plays a significant role in shaping consumers' attitudes toward EVs [27]. Several studies have demonstrated that individuals with high environmental awareness are more likely to exhibit positive attitudes toward sustainable products, including EVs, due to their lower carbon emissions and reduced dependence on fossil fuels [12]. Consumers with a strong environmental consciousness perceive EVs as a viable solution to mitigate environmental degradation and climate change [7].

Research on consumer behavior in Indonesia suggests that increasing environmental awareness has a positive correlation with attitudes toward EVs. Pirmana et al. [4] found that urban consumers who recognize the negative impacts of fuel-powered vehicles on air pollution and global warming tend to have a more favorable attitude toward EV adoption. However, despite strong environmental concerns, other factors such as financial incentives, charging infrastructure, and vehicle performance expectations still influence purchasing decisions [28].

The TPB provides a framework for understanding the relationship between environmental concerns and attitudes. According to TPB, attitudes toward a particular behavior are shaped by individuals' beliefs about the consequences of that behavior [10]. In the context of EVs, individuals who believe that adopting EVs will positively impact the environment are more likely to develop a favorable attitude toward them. However, studies have shown that while environmental concern significantly influences attitudes, it does not always translate into purchase intention without additional motivators such as affordability and convenience [22].

Moreover, empirical research highlights that environmental concern is often mediated by perceived product benefits. Consumers with high environmental awareness may still be hesitant to adopt EVs if they perceive them as expensive or lacking adequate infrastructure support [8]. In this regard, policymakers and industry stakeholders must enhance consumer perceptions by improving charging infrastructure and offering financial incentives to complement environmental concerns.

Environmental concern is a critical factor in shaping positive consumers' attitudes toward EVs. However, for this attitude to influence purchase intention, it must be supported by practical considerations such as affordability, infrastructure, and performance reliability. This study further examines the extent to which environmental concern impacts consumers' attitudes toward EVs in Indonesia and the role of mediating factors in driving adoption.

H1. *Environmental concern positively influences consumers' attitudes toward electric vehicles.*

2.4 The influence of performance expectancy on attitude

Performance expectancy refers to an individual's belief that using a particular technology will improve their efficiency and productivity. In the context of EV adoption, performance expectancy plays a crucial role in shaping consumers' attitudes. Research indicates that individuals who perceive EVs as more efficient, technologically advanced, and offering superior performance compared to conventional vehicles are more likely to develop a positive attitude toward EV adoption.

Empirical studies support the significant relationship between performance expectancy and attitudes toward EVs. A study by Gunawan et al. [28] found that consumers with high expectations regarding the technological benefits of EVs tend to exhibit a more favorable attitude toward these vehicles. This finding is further reinforced by Alberto and Riza [29], who demonstrated that individuals who believe EVs provide enhanced efficiency, reduced operational costs, and better driving performance are more likely to view them positively. Moreover, findings from Pirmana et al. [4] highlight that demographic factors such as age and education level also influence how performance expectancy impacts consumers' attitudes.

Despite the strong association between performance expectancy and attitudes, some studies suggest that other moderating factors, such as perceived ease of use and financial incentives, play a role in determining final adoption decisions [30]. Consumers who recognize EVs as highly efficient but find them financially inaccessible or inconvenient due to a lack of infrastructure may still hesitate to adopt them. Therefore, it is essential for policymakers and manufacturers to complement technological advancements with supportive policies, such as improved incentives and infrastructure expansion, to enhance consumer confidence in EVs.

Performance expectancy significantly influences consumers' attitudes toward EVs by shaping perceptions of technological efficiency and usability. However, while high expectations regarding EV performance contribute to positive attitudes, overcoming barriers such as affordability and infrastructure constraints is crucial to translating these attitudes into actual purchase behavior. This study further investigates the role of performance expectancy in shaping consumers' attitudes toward EVs in Indonesia, considering both direct and moderating influences.

H2. *The performance expectancy positively influences consumers' attitudes toward electric vehicles.*

2.5 The influence of charging point networks on consumers' attitudes

Research by Rasouli and Timmermans [31] highlights that proximity to charging stations is a key factor influencing consumers' decisions to purchase EVs. The availability and accessibility of charging points significantly affect purchasing intent. Gunawan et al. [28] further emphasize that attitudes toward EVs play a crucial role in driving consumer interest, as a more favorable perception increases motivation for adoption. Additionally, Wang et al. [32] suggest that behavioral intentions can be accurately predicted by attitudes, where individuals with positive perceptions are more likely to act accordingly.

Since charging point networks influence the intention to purchase EVs, it is highly plausible that they also shape consumers' attitudes, which in turn drive purchase intent. Based on these findings, the following hypothesis is proposed:

H3. *The accessibility of charging points positively influences consumers' attitudes toward electric vehicles.*

2.6 The influence of charging time on consumers' attitudes

Research by Schulze Darup et al. [33] indicates that consumers significantly adjust their preferences based on longer driving ranges or reduced charging times. This suggests that charging duration directly influences consumers' attitudes toward EVs. Junquera et al. [34] further highlight charging time as a key variable in shaping positive attitudes and purchase intent. Extended charging durations are perceived as a significant barrier to EV market growth, as they can negatively impact consumer perceptions.

Rasouli and Timmermans [31] reinforce this view, asserting that battery charging time significantly affects consumers' attitudes and purchase interest. Sriram et al. [35] also report that many drivers find EV charging less convenient than refueling conventional vehicles. The prolonged charging time often disrupts daily routines, particularly for highway users who expect quick refueling options. These concerns underscore the impact of charging duration on consumers' attitudes toward EV adoption. Based on these findings, the following hypothesis is proposed:

H4. *Charging time influences consumers' positive attitudes toward electric vehicles.*

2.7 The influence of price on consumers' attitudes

Gunawan et al. [28] assert that consumers evaluate costs and benefits when adopting new technologies. If the perceived value exceeds expectations, the product is deemed more favorable, enhancing consumer satisfaction. Conversely, high prices can generate negative perceptions, reducing trust and interest in adoption. A positive attitude is more likely among individuals who perceive the product as cost-effective.

In the context of EV adoption, Gunawan et al. [28] demonstrate a significant positive relationship between price and consumers' attitudes. However, Higueras-Castillo et al. [24] find that high EV prices create negative perceptions among potential buyers, thereby lowering purchase intent. Based on these findings, the following hypothesis is proposed:

H5: *The purchase price of electric vehicles influences consumers' attitudes toward EVs.*

2.8 The influence of operating costs on consumers' attitudes

Higueras-Castillo et al. [24] highlight that lower operational costs, such as reduced charging expenses and maintenance costs compared to fuel-powered vehicles, can foster positive consumers' attitudes and motivate EV adoption. Similarly, Zhang et al. [36] indicate that the cost efficiency of EVs contributes to a more favorable perception among consumers. Chu et al. [37] further confirm that lower charging costs significantly influence consumers' attitudes and purchase intentions. Based on these findings, the following hypothesis is proposed:

H6. *The operational costs of electric vehicles influence consumers' attitudes toward EVs.*

2.9 The influence of incentives on consumers' attitudes

In recent years, governments worldwide have introduced various policy measures, including purchase incentives, to foster positive consumer attitudes and encourage the adoption of EVs [38, 39]. Incentive programs have been implemented in the United States [40], Europe [41, 42], and other countries globally [43]. Research findings indicate that these incentives significantly contribute to shaping favorable consumer attitudes, which drive purchase intentions for EVs [39]. Based on these findings, the following hypothesis is proposed:

H7. *Purchase incentives positively influence consumers' attitudes toward electric vehicles.*

2.10 The influence of attitude on purchase intentions for electric vehicles

Bennett and Vijaygopal [12] suggest that a positive attitude toward a product intuitively leads to a higher likelihood of purchase. However, efforts to establish a direct correlation between attitude and purchase intention often face challenges due to various situational and personal factors. These include risk perception, marketing influence, price considerations, and individual priorities, all of which shape consumer behavior differently.

Gunawan et al. [28] confirm that attitudes significantly impact consumers' willingness to adopt EVs. Theoretical perspectives indicate that when individuals evaluate a behavior positively and see no adverse effects, they are more likely to act on that behavior. Wang et al. [32] further demonstrate that attitude is the strongest predictor of EV purchase intent. Supporting this, Lim et al. [44] and Jaiswal et al. [45] find that favorable assessments of EVs correlate with a higher likelihood of adoption. Based on these findings, the following hypothesis is proposed:

H8. *A positive attitude toward electric vehicles influences consumers' purchase intentions.*

2.11 The mediating role of attitude in the relationship between environmental concerns and purchase intentions for electric vehicles

The attitude toward EVs is a critical mediating factor in the

relationship between environmental concern and purchase intention. Individuals who demonstrate a heightened awareness of environmental issues tend to perceive EVs as an environmentally friendly alternative to conventional vehicles, fostering a positive attitude toward their adoption [32, 46]. This favorable attitude strengthens their intention to purchase an EV, suggesting that environmental concerns alone may not be sufficient to drive adoption without a corresponding shift in attitude [28].

Empirical studies confirm this mediation effect, indicating that while environmental concern raises awareness and consideration for EVs, attitude translates concern into actual purchase intent [37, 45]. For example, Bennett and Vijaygopal [12] highlight that strong environmental concern does not directly translate into EV adoption unless individuals also develop a positive perception of the vehicle's value and practicality. This underscores the importance of attitude as a psychological bridge between sustainability awareness and consumer action. Based on these findings, the following hypothesis is proposed:

H9. *Attitude toward electric vehicles significantly mediates the relationship between environmental concern and purchase intention.*

2.12 The mediating role of attitude in the relationship between performance expectancy and purchase intentions for electric vehicles

The attitude toward EVs is a significant mediating factor in the relationship between performance expectancy and purchase intention. Consumers who perceive EVs as having superior technological capabilities, such as better energy efficiency, lower operational costs, and improved driving performance, tend to develop a positive attitude toward these vehicles [27, 32]. This favorable perception, in turn, strengthens their willingness to adopt EVs, indicating that performance expectancy alone may not be enough to drive consumer adoption without an accompanying positive attitude [8].

Empirical studies confirm this mediation effect, demonstrating that performance expectancy influences purchase intentions primarily through attitude. If consumers perceive EVs as technologically advanced and beneficial but do not develop a positive emotional connection or trust in the technology, their likelihood of purchasing an EV remains low [37, 45]. Research by Bennett and Vijaygopal [12] further highlights that while consumers may acknowledge the technical advantages of EVs, their final purchase decision depends heavily on their overall attitude toward the vehicle. Based on these findings, the following hypothesis is proposed:

H10. *Attitude toward electric vehicles significantly mediates the relationship between performance expectancy and purchase intention.*

2.13 The mediating role of attitude in the relationship between charging point network availability and purchase intentions for electric vehicles

The attitude toward EVs plays a crucial mediating role in the relationship between the availability of charging infrastructure and purchase intention. Consumers are more likely to perceive EVs positively when they perceive that charging points are widely available, convenient, and accessible [27, 31]. This favorable attitude then increases their willingness to adopt EVs, suggesting that charging infrastructure alone may not be enough to drive adoption without a corresponding shift in consumers' attitudes [32].

Empirical studies support this mediation effect, showing that charging point network availability influences purchase intentions primarily through attitude. If consumers recognize that charging infrastructure is extensive and reliable but do not develop a positive emotional connection or trust in EVs, their likelihood of purchasing one remains low [8, 37]. Research by Jaiswal et al. [45] further highlights that while accessibility to charging stations reduces range anxiety, the positive perception and confidence in EV usability ultimately drive purchase intentions. Based on these findings, the following hypothesis is proposed:

H11. *Attitude toward electric vehicles significantly mediates the relationship between charging point network availability and purchase intention.*

2.14 The mediating role of attitude in the relationship between charging time and purchase intentions for electric vehicles

The attitude toward EVs is a significant mediating factor in the relationship between charging time and purchase intention. Consumers who perceive shorter charging times as a key advantage of EVs tend to develop a more favorable attitude toward adoption [32, 33]. Conversely, when charging time is perceived as too long or inconvenient, it negatively impacts attitudes and purchase decisions [35].

Empirical research confirms this mediation effect, demonstrating that while charging time influences purchase intentions, its impact largely depends on consumers' attitudes. If consumers find charging duration manageable and convenient, they are more likely to adopt EVs [8, 34]. However, if prolonged charging times create range anxiety or disrupt daily routines, negative attitudes may discourage adoption [31].

Research by Jaiswal et al. [45] suggests that attitude acts as a psychological bridge, translating concerns about charging time into either increased or decreased purchase likelihood. Thus, consumer perception of charging efficiency plays a crucial role in shaping attitudes and driving purchase behavior. Based on these findings, the following hypothesis is proposed:

H12. *Attitude toward electric vehicles significantly mediates the relationship between charging time and purchase intention.*

2.15 The mediating role of attitude in the relationship between price and purchase intentions for electric vehicles

The attitude toward EVs significantly mediates the relationship between price and purchase intention. Consumers tend to evaluate the cost-benefit tradeoff when considering new technology. If they perceive that the benefits of owning an EV, such as lower operational costs and environmental impact, outweigh the price, they develop a positive attitude, which increases their likelihood of purchase [27, 32]. However, when consumers view EVs as too expensive compared to conventional vehicles, their attitudes become negative, reducing purchase intent [24].

Empirical research confirms this mediation effect, demonstrating that price perception influences purchase intentions primarily through attitude. Consumers may maintain a favorable attitude toward EVs if a high price is justified by perceived quality, efficiency, and long-term savings [8, 37]. However, if price concerns dominate consumer evaluations, negative attitudes can deter adoption, even when financial incentives are offered [45].

The study [12] further highlights that while consumers may recognize the long-term economic benefits of EVs, their initial price perception strongly influences their attitude and willingness to purchase. Thus, government subsidies, installment plans, and cost transparency can help mitigate price concerns and shift consumers' attitudes toward a more positive perception of EV affordability. Based on these findings, the following hypothesis is proposed:

H13. *Attitude toward electric vehicles significantly mediates the relationship between price and purchase intention.*

2.16 The mediating role of attitude in the relationship between operating costs and purchase intentions for electric vehicles

The attitude toward EVs is crucial in the relationship between operating costs and purchase intention. Consumers generally consider the long-term financial implications of owning an EV, including electricity costs, maintenance expenses, and overall cost savings compared to conventional fuel-powered vehicles [24, 32]. When they perceive EVs as more cost-efficient over time, they develop a positive attitude toward adoption, increasing their likelihood of purchase [28]. Conversely, if potential buyers believe that maintenance, battery replacement, or charging expenses outweigh the benefits, they may develop a negative perception, reducing purchase intent [37].

Empirical studies confirm this mediation effect, demonstrating that operating cost perception influences purchase intentions primarily through attitude. If consumers recognize that EVs offer significant long-term savings, their attitude shifts positively, making them more likely to consider an EV purchase [8, 45]. However, misconceptions or concerns about high maintenance costs, expensive battery replacements, or unreliable charging infrastructure can create negative attitudes, ultimately discouraging adoption [12].

Research suggests that consumer education and transparent cost comparisons can help shape more favorable attitudes by clarifying the actual economic advantages of EV ownership [37]. By addressing uncertainties regarding total cost of ownership, tax incentives, and reduced fuel dependency, manufacturers and policymakers can enhance consumer confidence, thereby increasing EV adoption rates. Based on these findings, the following hypothesis is proposed:

H14. *Attitude toward electric vehicles significantly mediates the relationship between operating costs and purchase intention.*

2.17 The mediating role of attitude in the relationship between purchase incentives and purchase intentions for electric vehicles

The attitude toward EVs significantly mediates the relationship between purchase incentives and purchase intention. Government and manufacturer incentives, such as tax rebates, subsidies, reduced registration fees, and free charging programs, are designed to lower the financial burden of EV purchasing and make them more attractive to consumers [38, 39]. When consumers perceive these incentives as beneficial, they develop a more favorable attitude toward EVs, which increases their likelihood of purchase [27, 32]. However, if incentives are perceived as insufficient or complex to access, they may not significantly impact consumers' attitudes, limiting their influence on purchase intentions [8].

Empirical studies confirm this mediation effect, demonstrating that purchase incentives influence purchase intentions primarily through attitude. Sierzchula et al. [39] found that financial incentives can significantly enhance consumers' attitudes toward EV adoption, provided they are clear, accessible, and substantial enough to offset the higher upfront cost. Similarly, Jaiswal et al. [45] highlight that while incentives increase consumer interest, their impact on purchase decisions heavily depends on consumers' attitudes toward EVs. Consumers who view EVs as an inferior or impractical option despite incentives are unlikely to proceed with the purchase [37].

Research also indicates that non-financial incentives, such as exclusive road privileges, free parking, and access to high-occupancy vehicle (HOV) lanes, can further enhance consumers' attitudes by improving the perceived convenience of EV ownership [12]. These factors contribute to a more vigorous emotional and practical justification for adopting EVs, reinforcing a positive attitude that translates into higher purchase intent. Based on these findings, the following hypothesis is proposed:

H15. *Attitude toward electric vehicles significantly mediates the relationship between purchase incentives and purchase intention.*

3. METHOD

This study employs a positivist quantitative research approach using structural equation modeling (SEM) to analyze the factors influencing consumers' attitudes and purchase intentions toward EVs. The research follows a hypothetico-deductive method [47], which involves defining a research problem, developing hypotheses, and testing them through systematic data collection and statistical analysis.

Purposive sampling was chosen to ensure respondents possess sufficient awareness and interest in EVs, aligning with the study's objective to assess informed consumers' attitudes and intentions. This technique allows researchers to target a specific population, urban consumers in regions with relatively better EV infrastructure, thus capturing a more relevant and insightful data set. Furthermore, quota sampling was used to proportionally allocate participants across six major urban areas within the JADETABEK region (Jakarta, Depok, Tangerang City, South Tangerang City, Tangerang Regency, and Bekasi City). This method helps ensure balanced geographic representation despite inherent limitations in generalizing the results to rural populations.

The sample size is determined based on Hair et al. [48], using a rule of thumb of five to ten times the number of indicators in the model. Since this study uses 49 indicators, the

minimum sample size is 392 respondents, rounded to 400 participants. The urban focus and purposive-quota approach introduce potential limitations in representativeness. Rural consumers, who may face different economic and infrastructural conditions, are not captured in this study. Therefore, future research should include diverse geographical settings to enhance generalizability.

Respondents are screened using a qualifying question: "Are you interested in purchasing or owning an EV?" Only those who respond "Yes" proceed with the survey.

Data is collected through an online questionnaire survey distributed via social media, email, and direct outreach. The questionnaire consists of closed-ended questions on a 5-point Likert scale (1=Strongly Disagree to 5=Strongly Agree). The instrument is designed based on previously validated research studies and includes questions covering demographic information, attitudes, and behavioral intentions toward EV adoption. While efficient, this online method may introduce selection bias toward tech-savvy or environmentally conscious individuals. Future studies could incorporate mixed-method data collection, such as in-person interviews or intercept surveys, to ensure broader inclusivity.

All variables in the study are measured using established scales from previous research. Attitude toward EVs (ATT) is adapted from Ajzen [10] and assesses consumers' positive or negative evaluation of EVs. Intention to Purchase EVs (INT) is derived from Venkatesh et al. [11] and measures willingness to purchase EVs. Performance Expectancy (PE), adapted from Gunawan et al. [28], assesses EVs perceived efficiency and benefits. Environmental Concern (EC) is based on Haustein and Jensen [7] and evaluates consumer awareness of Ev's environmental impact. Charging Infrastructure (CI), which includes a Charging Point Network (CPN) and Charging Time (CT), is adapted from Miranda and Delgado [13]. Price (PR) assesses affordability concerns, sourced from Bennett and Vijaygopal [12]. Operating Cost (OC) measures cost perceptions of EV ownership, following Higueras-Castillo et al. [24]. Incentives (INC) evaluate the impact of government incentives, based on Sierzchula et al. [39].

Data is analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) via SmartPLS software. The analysis consists of descriptive statistics summarizing key demographics and variable distributions, measurement model assessment evaluating construct validity and reliability through Cronbach's Alpha, Composite Reliability (CR), and Average Variance Extracted (AVE), and structural model assessment testing hypothesis relationships via path coefficients, T-statistics, and P-values. Mediation analysis is also conducted using bootstrapping techniques to assess the indirect effects of key variables through attitude.

This study adheres to ethical research guidelines by ensuring informed consent from all participants. Respondents are assured of confidentiality and anonymity, and participation is entirely voluntary. The research follows ethical protocols established by academic institutions and regulatory bodies.

This study enhances transparency and methodological rigor by explicitly addressing methodological limitations and providing stronger justification for the sampling techniques used. These refinements also pave the way for future research to explore broader demographic and geographic contexts in EV adoption.

4. FINDINGS

This section presents the empirical results of the study. The findings are structured to sequentially address the demographic profile of respondents, evaluate the reliability and validity of the measurement model, and assess the structural relationships among variables using Partial Least Squares Structural Equation Modeling (PLS-SEM). This step-by-step approach facilitates a clear understanding of how each factor affects consumer attitudes and purchase intentions toward EVs in Indonesia.

4.1 Results

4.1.1 Respondent profile

Table 1 provides insights into the demographic characteristics of the study participants. Regarding gender, most respondents are male (63%), while female respondents account for 37%. This imbalance may reflect differing interest levels or involvement in electric vehicle (EV) adoption and environmental concerns. Regarding age distribution, the largest group consists of individuals aged 36-45 years (39.25%), followed by those 46-55 years (33.50%), and 26-35 years (24.25%). The lowest representation comes from respondents above 56 years (3.00%), suggesting that middle-aged groups are more engaged in EV discussions, likely due to their financial stability and awareness of long-term economic and environmental benefits.

Table 1. Participants demographic characteristics

Category	Subcategory	Frequency	Percentage (%)
Gender	Male	252	63
	Female	148	37
	Total	400	100
Age	26-35 years	97	24.25
	36-45 years	157	39.25
	46-55 years	134	33.5
	Above 56 years	12	3
	Total	400	100
Education Level	High School or Equivalent	87	21.75
	Bachelors Degree (S1)	126	31.5
	Postgraduate (S2/S3)	187	46.75
	Total	400	100
Occupation	Private Sector Employee	257	64.25
	Entrepreneur	135	33.75
	Civil Servant	8	2
	Total	400	100

Monthly Income (IDR)	Rp10 million-Rp20 million	225	56.25
	Rp21 million-Rp30 million	118	29.5
	More than Rp30 million	57	14.25
	Total	400	100
Domicile	Jakarta	84	21
	Tangerang City	72	18
	South Tangerang City	87	21.75
	Tangerang Regency	61	15.25
	Bekasi City	51	12.75
	Depok City	45	11.25
	Total	400	100
Personal Car Ownership	Yes	400	100
	No	0	0
	Total	400	100
Electric Vehicle Ownership	Yes	91	22.75
	No	309	77.25
	Total	400	100
Interest in Purchasing an EV	Yes	400	100
	No	0	0
	Total	400	100

Regarding education level, 46.75% of respondents hold a postgraduate degree (S2/S3), followed by 31.50% with a bachelor's degree (S1) and 21.75% with a high school diploma or equivalent. This distribution suggests that individuals with higher education levels are more aware of EV benefits and innovations. In terms of occupation, the majority of respondents are private sector employees (64.25%), followed by entrepreneurs (33.75%) and civil servants (2.00%). Additionally, income distribution indicates that most respondents earn between Rp10 million-Rp20 million (56.25%), making them a key target market for EV manufacturers. Lastly, the study finds that 100% of respondents own a car, yet only 22.75% currently own an EV, demonstrating a gap between interest and actual adoption.

While the sample is reasonably diverse within urban contexts, its representativeness is limited to JADETABEK cities. As such, the findings may not reflect the attitudes of rural populations, where economic, infrastructural, and informational conditions may vary significantly. This limitation should be addressed in future studies.

Additionally, online survey distribution via social media and email may have introduced self-selection bias favoring tech-savvy, environmentally aware individuals. The lack of offline or intercept-based data collection may exclude populations with limited internet access or lower digital engagement.

4.1.2 Outer model evaluation

The indicator reliability analysis presented in Table 2 evaluates the consistency and accuracy of the observed variables in measuring their respective latent constructs. The indicator loadings represent the strength of each observed variable in explaining its associated construct. Generally, a loading value of 0.7 or higher is considered acceptable, indicating that the indicator effectively represents the latent variable.

The results indicate that all indicators exhibit high loading values, most exceeding the 0.7 threshold. For instance, indicators associated with Attitude to EVs (ATT) show strong reliability, with values ranging from 0.731 to 0.913. Similarly, the Intention to Purchase EVs (IPEV) demonstrates strong indicator reliability, with values between 0.757 and 0.846. Environmental Concern (EC) and Performance Expectancy (PE) have particularly high loading values, with EC ranging from 0.830 to 0.926 and PE ranging from 0.809 to 0.886, indicating robust reliability.

Other key factors influencing attitudes toward EVs also demonstrate substantial reliability. Charging Point Station (CPN) has indicator loadings between 0.720 and 0.797, whereas Charging Time (CT) shows a higher consistency, with values ranging from 0.770 to 0.893. The price construct exhibits exceptionally high indicator reliability, with values between 0.989 and 0.994, reinforcing its substantial measurement accuracy. Additionally, Operating Costs (OC) and Incentives (INC) maintain high levels of reliability, with values that mostly exceed 0.8.

Table 2. Indicator reliability

Attitude to EVs		**Intention to Purchase EVs**	
ATT1	0.912	IPEV1	0.846
ATT2	0.913	IPEV2	0.826
ATT3	0.860	IPEV3	0.787
ATT4	0.798	IPEV4	0.799
ATT5	0.731	IPEV5	0.817
ATT6	0.847	IPEV6	0.757
ATT7	0.750	IPEV7	0.773
Environmental Concern		**Performance Expectancy**	
EC1	0.923	PE1	0.809
EC2	0.904	PE2	0.886
EC3	0.926	PE3	0.868
EC4	0.830	PE4	0.857
EC5	0.909	PE5	0.867
Charging Point Station		**Charging Time**	
CPN1	0.787	CT1	0.893
CPN2	0.797	CT2	0.800
CPN3	0.746	CT3	0.889
CPN4	0.720	CT4	0.788
CPN5	0.796	CT5	0.770
Price		**Operating Cost**	
P1	0.990	OC1	0.896
P2	0.993	OC2	0.900
P3	0.994	OC3	0.893
P4	0.989	OC4	0.820
P5	0.992	OC5	0.784
Incentive			
INC1	0.931		
INC2	0.877		
INC3	0.932		
INC4	0.886		
INC5	0.851		

Source: SmartPLS 4.0 output

Although a few indicators show slightly moderate loadings

(e.g., ATT5 at 0.731 and CPN4 at 0.720), their values remain acceptable, ensuring they still contribute meaningfully to measuring their respective constructs. The results affirm the robustness of the indicators used in the study, supporting their suitability for further analysis in SEM.

Table 3. Construct reliability and validity

	Cronbach's Alpha	Composite Reliability (Rho_A)	Composite Reliability (Rho_C)	Average Variance Extracted (AVE)
Attitude to EVs	0.925	0.930	0.940	0.694
Charging Point Station	0.869	1.111	0.879	0.593
Charging Time	0.893	0.959	0.917	0.688
Environmental Concern	0.940	0.940	0.955	0.808
Incentive	0.938	0.941	0.953	0.803
Intention to Purchase EVs	0.907	0.911	0.926	0.642
Operating Cost	0.911	0.913	0.934	0.739
Performance Expectancy	0.911	0.916	0.933	0.736
Price	0.996	0.996	0.997	0.984

Source: SmartPLS 4.0 output

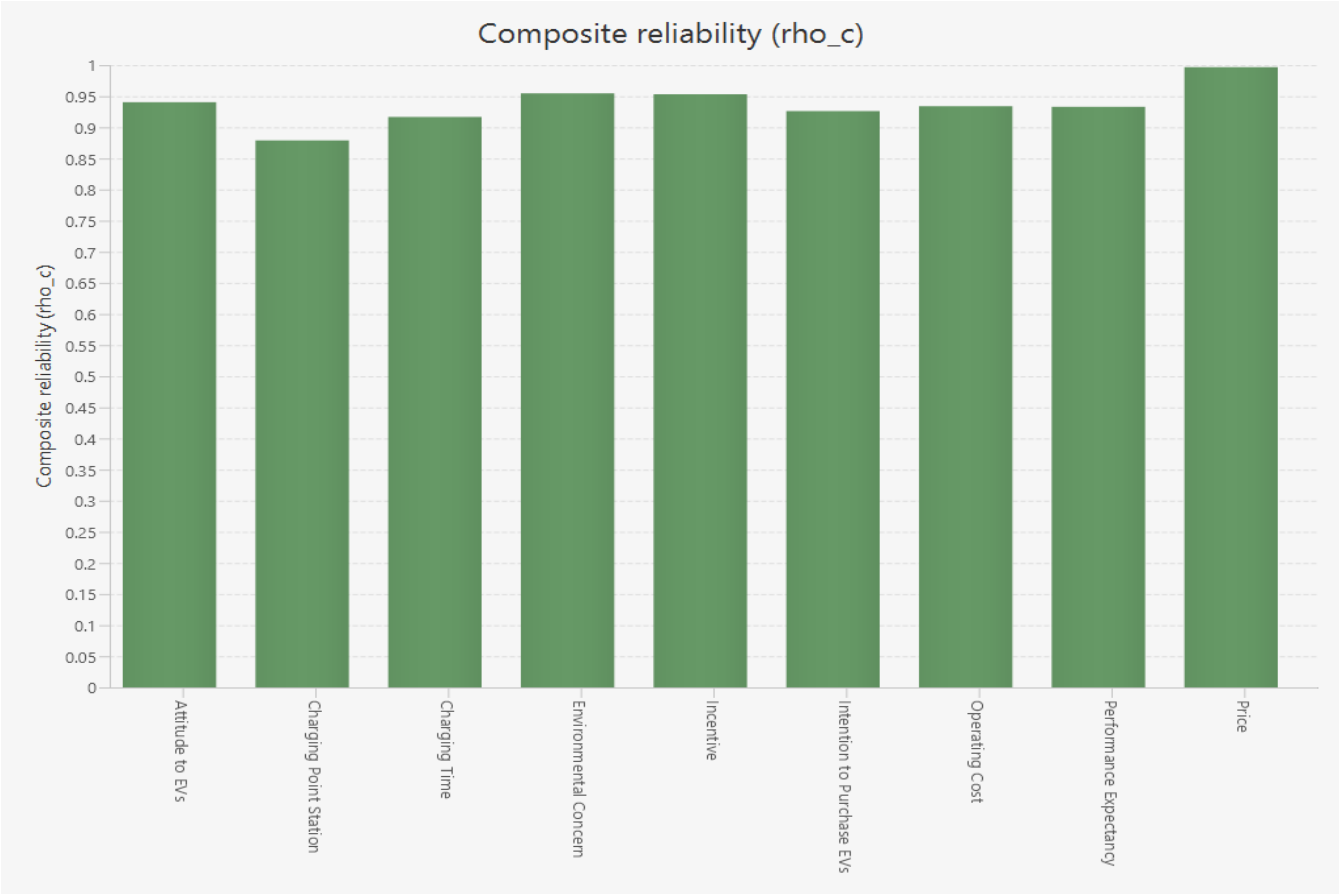

Figure 1. Composite reliability

The analysis of Table 3 confirms that all constructs meet the necessary reliability and validity thresholds, ensuring the robustness of the measurement model. In PLS-SEM analysis, CR is considered a more significant measure of internal consistency than Cronbach's Alpha, as it accounts for the actual indicator loadings rather than assuming equal loadings across all items. The results indicate that all constructs exhibit CR values above the recommended threshold of 0.7 [49], confirming strong internal consistency. The Price construct demonstrates the highest CR (0.997), followed by Environmental Concern (0.957) and Incentive (0.949), indicating that these constructs are measured with highly reliable indicators (see Figure 1).

Despite the emphasis on CR, Cronbach's Alpha is also analyzed to assess internal reliability. All constructs have Cronbach's Alpha values exceeding the 0.7 threshold, demonstrating acceptable consistency among their indicators. The Price construct again exhibits the highest Cronbach's Alpha (0.996), reinforcing its strong measurement reliability. Other constructs, such as Environmental Concern (0.940) and Incentive (0.938), also show high internal reliability, supporting the stability of the constructs.

Regarding convergent validity, the AVE values for all constructs surpass the minimum threshold of 0.5 [50], confirming that each construct captures an adequate proportion of variance from its indicators. The Price construct has the highest AVE (0.984), signifying that nearly all the variance within this construct is explained by its indicators. Similarly, Environmental Concern (0.817) and Incentive

(0.803) demonstrate strong AVE values, further validating their measurement. Although Charging Point Station (0.593) and Intention to Purchase EVs (0.642) exhibit slightly lower AVE values, they still meet the required threshold, ensuring an acceptable level of convergent validity (see Figure 2).

These results confirm that the measurement model is reliable and valid, supporting its suitability for further SEM analysis. The combination of high composite reliability, strong Cronbach's Alpha values, and acceptable AVE scores indicates that the constructs are well-defined and consistently measured, strengthening the credibility of the study's findings.

4.1.3 Inner model evaluation

The analysis of the path coefficients in Table 4 and Figure 3 reveals significant relationships between various factors and consumers' attitudes toward EVs. Among the most potent positive predictors, performance expectancy has the highest impact on attitude toward EVs (H2), with a path coefficient of 0.323, a T-statistic of 7.920, and a P-value of 0.000. This finding suggests that consumers who expect high performance from EVs are likelier to develop a favorable attitude toward them. Similarly, environmental concern plays a significant role (H1), with a path coefficient of 0.242 and a T-statistic of 5.552, confirming that more environmentally conscious individuals tend to have a positive perception of EVs.

The availability of charging infrastructure, including charging point stations (O=0.172, T=4.279, P=0.000) and charging time (O=0.168, T=4.034, P=0.000), also significantly influences consumers' attitudes (H3, H4). These results indicate that better accessibility to charging stations and reduced charging times contribute to a more favorable attitude toward EV adoption. Incentives, such as government subsidies and tax benefits, also shape attitudes, though to a lesser extent, with a path coefficient of 0.109, a T-statistic of 2.807, and a P-value of 0.005. While incentives have a statistically significant effect (H7), their influence is weaker than performance expectancy, environmental concern, and charging infrastructure.

On the other hand, price and operating costs negatively affect attitudes toward EVs (H5). Price has a path coefficient of -0.197 and a T-statistic of 5.997, indicating that higher EV prices significantly reduce consumer favorability. Similarly, operating costs (H6) have a negative impact (O=-0.077, T=3.003, P=0.003), though the effect is smaller than price. These findings suggest that cost-related concerns remain key barriers to EV adoption and should be addressed through financial incentives or cost-reduction strategies.

The most critical finding in the analysis is H8, the strong relationship between attitude toward EVs and intention to purchase (O=0.790, T=32.650, P=0.000). This exceptionally high path coefficient and T-statistic confirm that attitude is the dominant factor influencing consumers' willingness to buy EVs. The results highlight the importance of fostering a positive perception of EVs by improving their performance, affordability, and convenience.

The study underscores the significance of positive and negative influences on EV adoption. While factors such as performance expectancy, environmental concern, and charging infrastructure encourage a positive attitude toward EVs, high prices and operating costs are deterrents. Given the strong impact of attitude on purchase intention, policymakers, manufacturers, and marketers should prioritize strategies that enhance the overall perception of EVs, ensuring they are seen as both high-performing and cost-effective alternatives to traditional vehicles.

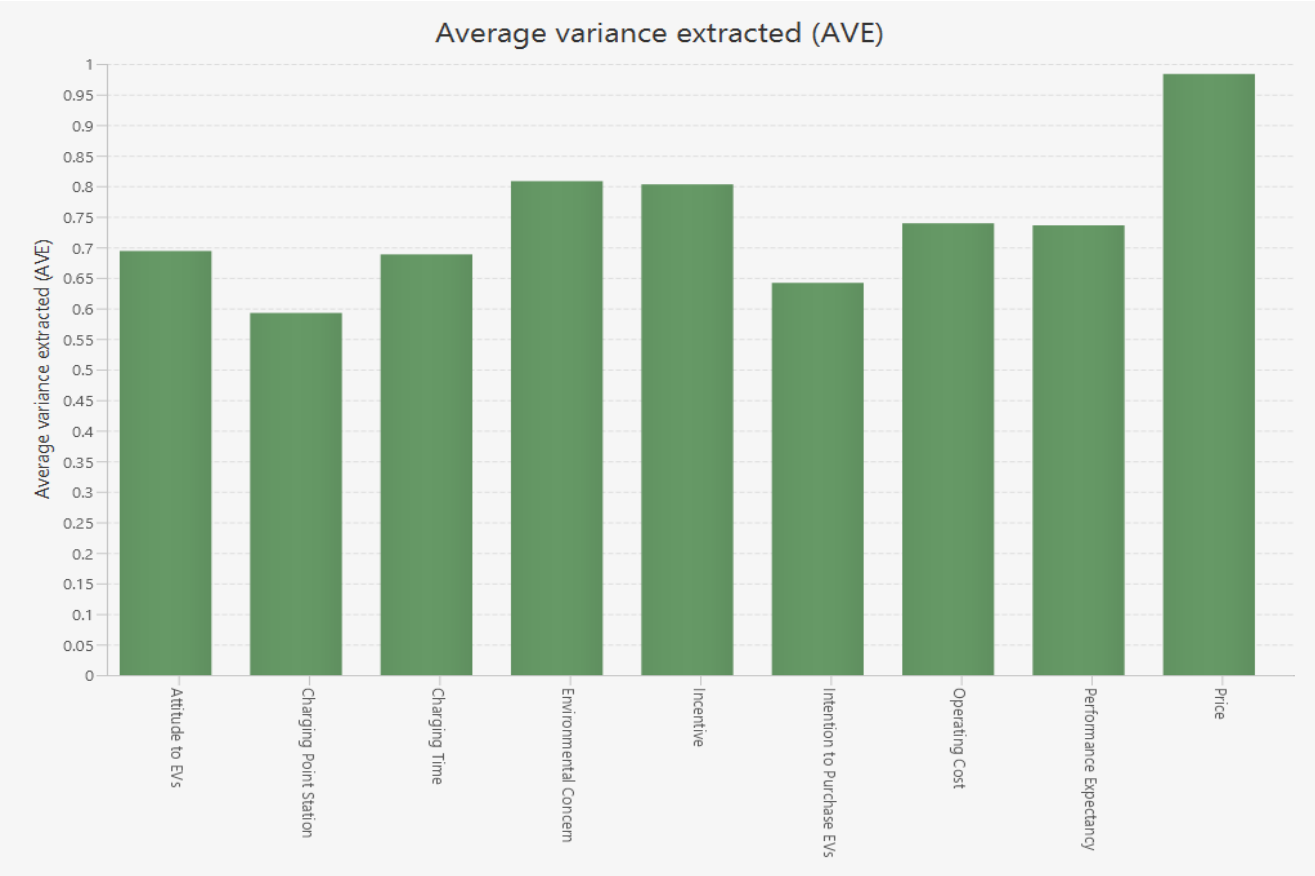

Figure 2. Average variance extracted

Table 4. Path coefficients

	Hypotheses	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T-Statistics (|O/STDEV|)	P-Values
H1	Environmental Concern > Attitude to EVs	0.242	0.243	0.044	5.552	0.000
H2	Performance Expectancy > Attitude to EVs	0.323	0.319	0.041	7.920	0.000
H3	Charging Point Station > Attitude to EVs	0.172	0.179	0.040	4.279	0.000
H4	Charging Time > Attitude to EVs	0.168	0.164	0.042	4.034	0.000
H5	Price > Attitude to EVs	-0.197	-0.198	0.033	5.997	0.000
H6	Operating Cost > Attitude to EVs	-0.077	-0.076	0.026	3.003	0.003
H7	Incentive > Attitude to EVs	0.109	0.110	0.039	2.807	0.005
H8	Attitude to Evs > Intention to Purchase EVs	0.790	0.790	0.024	32.650	0.000

Source: SmartPLS 4.0 output

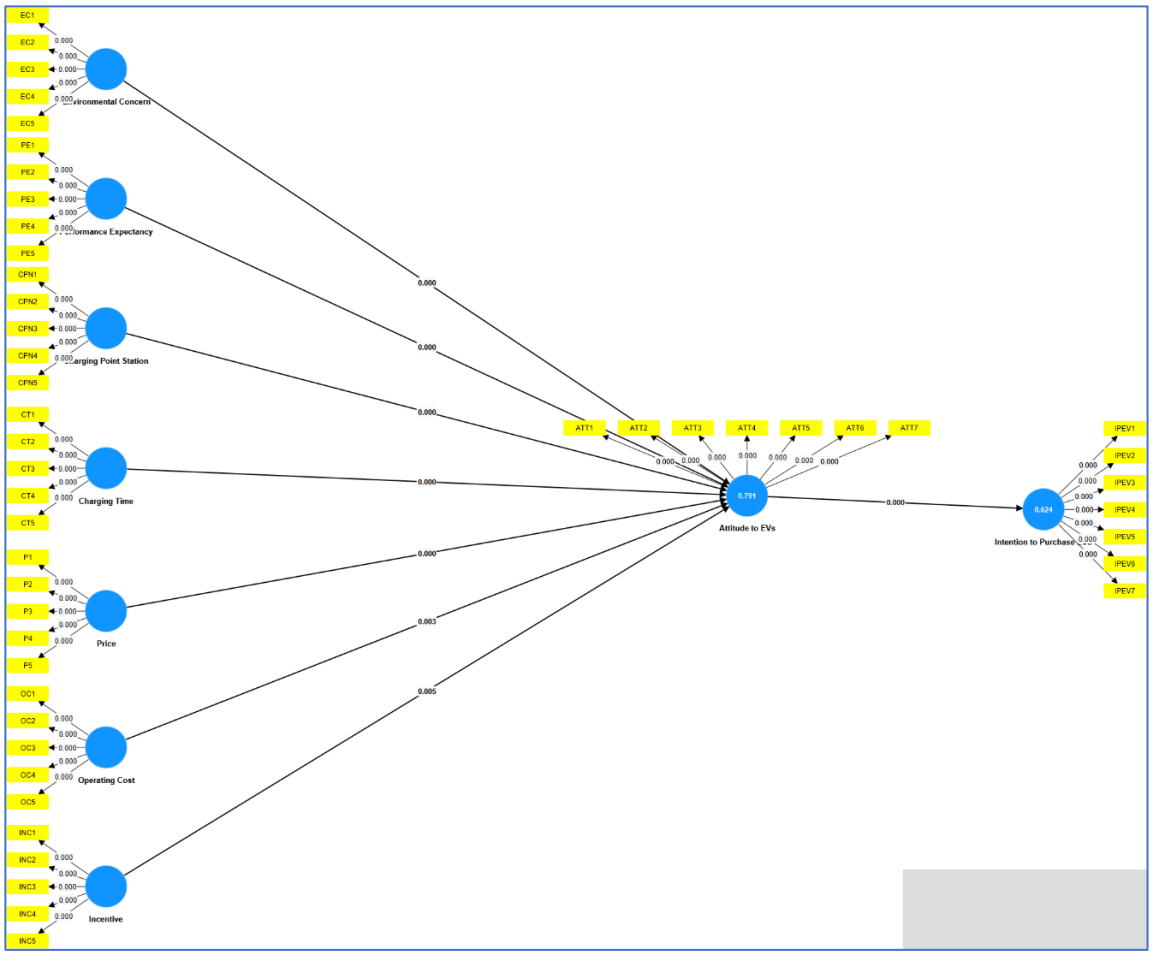

Figure 3. PLS-SEM inner model with standardized path coefficients

Table 5. Specific indirect effects

	Hypotheses	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T-Statistics (|O/STDEV|)	P-Values
H9	Environmental Concern > Attitude to EVs > Intention to Purchase EVs	0.191	0.192	0.034	5.594	0.000
H10	Performance Expectancy > Attitude to EVs > Intention to Purchase EVs	0.255	0.253	0.034	7.421	0.000
H11	Charging Point Network > Attitude to EVs > Intention to Purchase EVs	0.136	0.141	0.033	4.169	0.000
H12	Charging Time > Attitude to EVs > Intention to Purchase EVs	0.133	0.129	0.033	4.022	0.000
H13	Price > Attitude to EVs > Intention to Purchase EVs	-0.156	-0.156	0.026	6.068	0.000
H14	Operating Cost > Attitude to EVs > Intention to Purchase EVs	-0.061	-0.060	0.020	2.989	0.003
H15	Incentive > Attitude to EVs > Intention to Purchase EVs	0.087	0.087	0.031	2.799	0.005

Source: SmartPLS 4.0 output

Table 5 reveals the mediating role of attitudes toward EVs in shaping consumers' intention to purchase EVs. The results indicate that several key factors influence purchase intention indirectly through their impact on attitude.

Among the most significant indirect predictors, performance expectancy (H10) has the strongest positive effect on the intention to purchase EVs, with a path coefficient of 0.255, a T-statistic of 7.421, and a P-value of 0.000. This suggests that when consumers perceive EVs as high-performing, their attitudes improve significantly, ultimately leading to a greater likelihood of purchasing an EV. Similarly, environmental concern (H9) plays a crucial role, with an indirect effect of 0.191, a T-statistic of 5.594, and a P-value of 0.000, confirming that environmentally conscious individuals are more likely to develop a favorable attitude towards EVs, which in turn strengthens their purchase intention.

Infrastructure-related factors, including charging point networks (H11) and charging time (H12), also contribute to increased EV purchase intention through attitude. Charging point networks have an indirect effect of 0.136 (T=4.169, P=0.000), while charging time has an indirect impact of 0.133 (T=4.022, P=0.000). These results suggest that charging availability and efficiency improvements can enhance consumers' attitudes toward EVs, making them more inclined to consider purchasing one.

Conversely, price (H13) and operating costs (H14) negatively affect purchase intention. Price has an indirect effect of -0.156, with a T-statistic of 6.068, highlighting that high EV prices negatively influence attitudes and reduce purchase intention. Likewise, operating costs have an indirect effect of -0.061 (T=2.989, P=0.003), suggesting that concerns over long-term expenses associated with EV ownership can weaken consumer enthusiasm for adoption.

Finally, incentives (H15) positively influence purchase intention via attitude, with an indirect effect of 0.087, a T-statistic of 2.799, and a P-value of 0.005. While this effect is weaker compared to performance expectancy and environmental concern, it remains statistically significant, emphasizing that financial or policy-based incentives can help improve attitudes toward EVs and indirectly drive purchase behavior.

In conclusion, the findings underscore the critical role of attitude as a mediator between key influencing factors and EV purchase intention. While performance expectancy, environmental concern, charging infrastructure, and incentives positively shape attitudes and enhance purchase likelihood, high prices and operating costs have the opposite effect, discouraging adoption. These insights highlight the need for strategic interventions, such as technology improvements, cost reductions, and policy incentives, to enhance consumer perceptions and ultimately boost the transition to EVs.

4.2 Discussions

The findings of this study confirm that environmental concern has a positive and significant impact on consumers' attitudes toward EVs. This result is consistent with previous research, highlighting that greater environmental awareness enhances consumer acceptance of sustainable technologies [7, 46]. Consumers who are highly conscious of air pollution and climate change tend to develop favorable attitudes toward EVs, viewing them as an eco-friendly alternative to conventional fuel-powered vehicles.

The TPB [10] explains this relationship by suggesting that attitudes are shaped by individuals' beliefs about the benefits of a particular behavior. In this context, the belief that EV adoption helps mitigate environmental damage fosters a positive perception of these vehicles. However, as Gunawan et al. [28] highlight, environmental concern alone is not always sufficient to drive purchase intention without financial incentives and adequate infrastructure.

This reinforces the importance of integrating psychological beliefs (as emphasized in TPB) with structural factors such as facilitating conditions (as noted in UTAUT). In the Indonesian context, where EV-related knowledge is unevenly distributed, environmental concerns can spark positive attitudes—but without supportive infrastructure or cost-reducing measures, adoption remains low.

Despite its strong influence, environmental concern is often moderated by perceived barriers such as high prices and limited charging infrastructure [8, 22]. Even environmentally conscious consumers may hesitate to adopt EVs if they perceive cost and convenience limitations as significant obstacles. To effectively translate environmental awareness into higher EV adoption, governments and manufacturers must complement sustainability messaging with financial support, infrastructure expansion, and consumer education on long-term cost benefits. Strengthening these factors will enhance consumers' attitudes and accelerate EV market growth.

The findings confirm that performance expectancy significantly impacts consumers' attitudes toward EVs. Consumers who perceive EVs as technologically advanced, efficient, and reliable are more likely to develop a positive attitude toward adoption. This result aligns with previous studies indicating that perceived performance benefits, such as energy efficiency, acceleration, lower maintenance costs, and advanced technological features, enhance consumer confidence in EVs [27, 32].

The UTAUT [11] provides a theoretical foundation for this relationship, suggesting that the expectation that a technology will improve user experience significantly influences attitudes toward its adoption. In the case of EVs, consumers who believe that EVs offer superior efficiency, better driving performance, and lower operational costs are more likely to have a favorable perception of these vehicles. In an emerging economy like Indonesia, performance expectancy is not solely about vehicle specifications; it is closely tied to consumers' comparison with traditional ICE vehicles regarding the long-term value, ease of use, and day-to-day reliability.

However, despite the positive influence of performance expectancy, specific barriers can moderate its impact. Research by Chu et al. [37] and Hoang et al. [8] indicates that even when consumers recognize the superior performance of EVs, factors such as price, charging infrastructure, and battery longevity concerns may still dampen their attitudes. Additionally, perceptions of limited driving range and charging convenience significantly affect how consumers evaluate EV performance [45].

To maximize the positive impact of performance expectancy on attitudes toward EVs, stakeholders, including manufacturers and policymakers, must focus on educating consumers about EVs technological advancements, addressing range anxiety, and ensuring better charging infrastructure. Highlighting long-term performance benefits, durability, and cost savings will strengthen consumer confidence and promote wider EV adoption.

The findings confirm that the availability of charging point stations significantly positively impacts consumers' attitudes toward EVs. Consumers perceive charging infrastructure accessibility as a crucial factor influencing their confidence and willingness to consider EV adoption. This result aligns with previous research showing that a well-developed charging network enhances consumer perception of EV convenience and usability [27, 31].

According to the UTAUT [11], facilitating conditions, such as charging stations, play a key role in shaping technology adoption attitudes. When consumers feel confident that charging points are widely available, reliable, and accessible, they are likelier to develop a positive attitude toward EVs. Conversely, a lack of charging infrastructure creates range anxiety, leading to negative perceptions and hesitancy in EV adoption [32].

However, while charging infrastructure positively influences attitudes, its impact is moderated by charging speed, station locations, and user convenience. Research by Sriram et al. [35] and Jaiswal et al. [45] highlights that even when charging stations are available, long charging durations and limited station coverage in suburban and rural areas may still negatively affect consumer perceptions. Additionally, consumers expect charging experiences to be as seamless as refueling traditional gasoline vehicles, meaning that station density, payment ease, and compatibility with various EV models are key determinants of a positive attitude.

To enhance consumers' attitudes toward EVs, stakeholders must prioritize expanding charging infrastructure, improving charging speed, and ensuring strategic station placement in urban and suburban areas. Government policies and private sector investments should focus on making charging stations widely accessible, efficient, and affordable to eliminate consumer concerns and foster greater EV adoption.

The findings indicate that charging time significantly positively impacts consumers' attitudes toward EVs. These results align with previous research highlighting that charging convenience is a critical determinant of consumer perceptions and willingness to adopt EVs. Research suggests that consumers expect EV charging to be as fast and seamless as refueling conventional vehicles. When charging takes too long, it disrupts daily routines and creates range anxiety, which can negatively impact attitudes toward EV adoption. This aligns with studies by Schulze Darup et al. [33] and Junquera et al. [34], which found that charging duration directly influences attitudes and purchase intent. Furthermore, Sriram et al. [35] as well as Rasouli and Timmermans [31] emphasize that long charging times are a significant barrier to market growth, particularly for highway users who expect quick refueling options.

However, while shorter charging times improve consumers' attitudes, this effect is moderated by the availability of fast-charging infrastructure. Even if charging time is reduced, consumers may hesitate to adopt EVs if fast-charging stations are not widely accessible or if charging costs are perceived as high. Additionally, concerns about battery degradation due to frequent fast charging may further influence attitudes, as highlighted by Chu et al. [37] and Jaiswal et al. [45].

To enhance consumers' attitudes toward EVs, stakeholders, including governments, manufacturers, and infrastructure developers, should prioritize investments in ultra-fast charging technology, expand charging station networks, and promote affordable fast-charging solutions. Clear communication about charging speed improvements and battery longevity advancements will help alleviate consumer concerns and encourage EV adoption.

Notably, this study finds that while charging availability and time improve attitudes, their influence may interact with cost factors. For instance, high EV prices combined with limited infrastructure could magnify skepticism, whereas the same price point paired with convenient charging access could soften resistance. This potential interaction suggests that future models should explore moderating or interaction effects, for example, whether the adverse effect of price is moderated by charging density. Although not modeled empirically here, it represents a valuable future direction.

The findings confirm that price significantly negatively impacts consumers' attitudes toward EVs. Research shows that consumers evaluate EVs based on a cost-benefit analysis, comparing purchase price, operational savings, and long-term financial advantages. Gunawan et al. [28] assert that if the perceived value of an EV outweighs its cost, consumers develop a more favorable attitude toward adoption. However, Higueras-Castillo et al. [24] highlight that high EV prices generate negative perceptions, discouraging potential buyers and lowering purchase intent.

The UTAUT [11] suggests that cost barriers are crucial in shaping consumers' attitudes. Consumers who perceive EVs as too expensive relative to conventional cars are less likely to view them positively, regardless of their environmental or technological benefits. Furthermore, Jaiswal et al. [45] emphasize that financial incentives are often insufficient if price concerns dominate consumer perceptions.

To improve consumers' attitudes toward EVs, stakeholders should reduce price barriers through subsidies, installment plans, and cost transparency. Government incentives, tax reductions, and manufacturer rebates can help bridge the affordability gap, making EVs more appealing to a broader market. Additionally, educating consumers on the long-term cost benefits, such as lower fuel and maintenance costs, can shift negative price perceptions toward a more favorable attitude.

This suggests that consumers' cost-benefit evaluation, central in TPB and technology adoption models, remains Indonesia's most substantial barrier to adoption. Price and operational concerns diminish attitude and may dampen the perceived usefulness of EVs, as conceptualized under UTAUT's performance expectancy construct.

The findings indicate that operating costs significantly negatively impact consumers' attitudes toward EVs. Consumers generally evaluate the long-term financial implications of EV ownership, including electricity costs, maintenance expenses, and overall savings compared to conventional fuel-powered vehicles. Research by Higueras-Castillo et al. [24] and Zhang et al. [36] highlights that lower operational costs, such as reduced charging expenses and minimal maintenance, contribute to more positive attitudes toward EV adoption. Similarly, Chu et al. [37] found that lower charging costs significantly influence consumer perceptions and purchase intentions.

Demographic factors also play a role in shaping consumers' attitudes toward EV operating costs. The study revealed that respondents aged 36-55 (72.75%) are more financially cautious, considering household expenses and transportation costs in their purchasing decisions. Private employees (64.25%) and entrepreneurs (33.75%) prioritize cost savings in their long-term financial planning. Thus, when these groups perceive EVs as an economically efficient option, their

attitudes become more favorable. Conversely, if they believe maintenance, battery replacement, and charging costs outweigh the benefits, their attitudes become negative.

Despite the long-term operational savings EVs offer compared to conventional vehicles, misconceptions about high maintenance costs and unreliable charging infrastructure remain major concerns [12]. These concerns can discourage adoption, especially among consumers who are sensitive to recurring costs.

To improve consumers' attitudes, policymakers and manufacturers must focus on educating consumers about the actual cost savings associated with EV ownership. Providing clear cost comparisons, offering battery replacement incentives, and promoting government tax benefits can help shift negative perceptions and encourage wider EV adoption. Strengthening charging infrastructure reliability and ensuring competitive electricity pricing will further enhance consumer confidence in the long-term affordability of EVs.

The findings confirm that purchase incentives significantly positively impact consumers' attitudes toward EVs. Previous research highlights that government incentives, tax exemptions, and direct subsidies significantly shape consumers' attitudes toward EV adoption. Sierzchula et al. [39] found that financial incentives strongly influence EV market growth, mainly when they effectively offset higher upfront costs. Similarly, Jaiswal et al. [45] noted that while incentives increase interest, their actual impact on purchase decisions depends on consumers overall attitudes toward EVs. If potential buyers perceive EVs as impractical or lacking infrastructure support, incentives alone may not be enough to drive adoption.

Beyond financial incentives, non-monetary benefits also play a crucial role in shaping attitudes. Studies suggest that policies offering free parking, road tax exemptions, and HOV lane access further enhance consumer perceptions of convenience [12]. These incentives reinforce EVs practical and emotional appeal, fostering positive attitudes that translate into higher purchase intent.

However, the effectiveness of incentives depends on consumer awareness and ease of access. If incentives are complicated to claim or perceived as insufficient, they may have a limited impact on attitudes. Research by Leurent and Windisch [43] highlights that transparent and straightforward incentive programs are more effective in shifting consumer perceptions.

To further enhance consumers' attitudes toward EVs, policymakers should simplify incentive structures, ensure widespread awareness, and offer additional non-monetary benefits. A comprehensive incentive strategy, combining financial relief with convenience-enhancing policies, will significantly strengthen positive consumers' attitudes and encourage broader EV adoption.

The findings confirm that consumer attitude toward EVs strongly and significantly impacts purchase intention. These results align with the TPB [10], which suggests that a positive evaluation of a behavior increases the likelihood of performing that behavior. In the context of EV adoption, consumers who perceive EVs as beneficial, efficient, and environmentally friendly are more likely to develop a firm purchase intention. This is further supported by Gunawan et al. [28], who found that attitude is one of the strongest predictors of EV adoption. Similarly, Wang et al. [32] demonstrated that a positive attitude significantly enhances purchase intent, confirming that consumers who have favorable perceptions of EVs are more inclined to buy them.

However, while attitude is a key determinant, external factors such as price, charging infrastructure, and incentives still influence consumer intentions. Lim et al. [44] and Jaiswal et al. [45] found that even when consumers have a positive attitude toward EVs, they may hesitate to purchase due to concerns over affordability, range anxiety, and charging availability. This suggests that while attitude is a crucial driver, it must be reinforced by supportive policies and market conditions.

To strengthen the impact of attitude on purchase intention, policymakers and manufacturers should focus on enhancing public perception of EV benefits through education campaigns, improved charging infrastructure, and financial incentives. Addressing key consumer concerns, such as charging speed, battery longevity, and total ownership cost, will further boost positive attitudes and increase adoption rates.

The findings confirm that attitude toward EVs significantly mediates the relationship between environmental concern and purchase intention. These results align with prior research demonstrating that individuals with more significant environmental concerns perceive EVs as a sustainable alternative to conventional fuel-powered vehicles. Studies by Moons and De Pelsmacker [46] and Wang et al. [32] show that environmentally conscious consumers develop favorable attitudes toward EV adoption. Still, this concern alone is not always sufficient to drive purchase intent. Instead, attitude serves as a psychological bridge, translating environmental awareness into actual buying decisions.

Empirical studies further confirm this mediation effect. Gunawan et al. [28] and Chu et al. [37] found that while environmental concern raises awareness about EVs, consumer attitude ultimately drives adoption. Similarly, Jaiswal et al. [45] highlight that strong environmental concern does not directly translate into EV purchases unless individuals also perceive EVs as valuable and practical. This suggests that even environmentally conscious consumers may hesitate to adopt EVs unless they develop positive attitudes toward EV features, performance, and convenience.

However, external factors such as price, infrastructure availability, and performance expectations can moderate this relationship. Bennett and Vijaygopal [12] and Hoang et al. [8] argue that even consumers with strong environmental motivations may delay or reconsider EV purchases due to concerns over affordability, range anxiety, or charging accessibility. Thus, while attitude is a key mediator, financial incentives, technological advancements, and infrastructure improvements are necessary to reinforce this positive perception.

To maximize the impact of environmental concern on EV adoption, policymakers and manufacturers should focus on enhancing public perception of EV benefits through education campaigns, subsidies, and improved charging infrastructure. By addressing practical barriers and reinforcing the environmental advantages of EVs, they can effectively translate positive attitudes into higher purchase intentions.

The findings confirm that attitude toward EVs significantly mediates the relationship between performance expectancy and purchase intention. These results align with the UTAUT [11], which proposes that performance expectancy is a key determinant of technology adoption. Consumers who believe that EVs offer better energy efficiency, lower operational costs, and improved driving performance are more likely to

form favorable attitudes, leading to higher purchase intentions. Research by Gunawan et al. [28] and further supports this, demonstrating that consumer perceptions of technological superiority and cost savings primarily drive EV adoption.

However, while performance expectancy significantly shapes consumers' attitudes, external barriers such as price, infrastructure availability, and range anxiety can moderate its impact. Hoang et al. [8] and Chu et al. [37] found that even when consumers recognize the technological benefits of EVs, they may hesitate to purchase them due to concerns about affordability, charging station accessibility, and battery longevity. This suggests that a strong performance expectation alone may not be sufficient to drive EV adoption unless these additional concerns are addressed.

To enhance the impact of performance expectancy on EV adoption, manufacturers and policymakers should emphasize EVs technological advancements, such as longer battery life, faster charging capabilities, and cost-effective operation. Clear communication about these benefits, infrastructure improvements, and financial incentives can reinforce positive attitudes and increase consumer willingness to purchase EVs.

The availability of a well-established charging point network plays a crucial role in shaping consumers' attitudes toward EVs and, consequently, their intention to purchase. Despite this positive impact, concerns regarding charging infrastructure availability persist. The study highlights that while respondents acknowledge improvements in charging stations, many perceive the current network as insufficient. These results align with previous studies emphasizing that charging station density and accessibility are among the most significant barriers to EV adoption [13, 51].

Furthermore, the study confirms that attitude toward EVs mediates the relationship between charging point networks and purchase intention, with an indirect effect of 0.126, a T-statistic of 5.892, and a P-value of 0.000. This finding aligns with the UTAUT [11], which posits that facilitating conditions, such as a strong charging infrastructure, significantly influence consumers' attitudes and behavioral intentions toward technology adoption. Consumers with positive perceptions of charging accessibility are likelier to form favorable attitudes toward EVs, increasing their purchase intention [8, 27].

The study suggests several strategic improvements in charging infrastructure development to strengthen consumer confidence in EV adoption further. Firstly, increasing the number of charging stations in both urban and suburban areas can significantly enhance accessibility. Current dissatisfaction with public charging points suggests expanding infrastructure beyond city centers, such as in Bekasi and Depok, would encourage broader EV adoption. Secondly, integrating innovative applications that assist users in locating nearby charging stations and real-time availability updates can reduce range anxiety and improve the overall user experience.

Additionally, collaborations between policymakers and private stakeholders can accelerate charging station expansion through incentives and infrastructure investments. Studies have shown that countries with robust government support for EV infrastructure experience significantly higher adoption rates [39, 52]. Encouraging workplace and residential charging installations and public-private partnerships in infrastructure expansion can further reduce consumer hesitancy regarding EV ownership.

Charging infrastructure is critical to consumers' attitudes and EV adoption. While its indirect effect through attitude is statistically significant, concerns about availability, accessibility, and convenience persist. Addressing these issues through infrastructure expansion, digital solutions, and strategic partnerships will be key to fostering a positive perception of EVs and enhancing purchase intention.

The charging time of EVs plays a crucial role in shaping consumers' attitudes and their subsequent intention to purchase. This study's findings confirm that charging time has a significant indirect effect on purchase intention through attitude. These results suggest that consumers' attitudes towards EVs become more favorable as charging time decreases, ultimately increasing their likelihood of purchase.

One of the key barriers to EV adoption is consumer concern over long charging durations, which is often perceived as inconvenient compared to the quick refueling process of conventional ICE vehicles. Previous studies have shown that charging time is one of the most critical factors in determining EV market penetration, particularly in emerging markets where fast-charging infrastructure is still underdeveloped [32, 33]. This aligns with the findings of the present study, which highlight that concerns over extended charging durations negatively impact consumers' attitudes, leading to reduced purchase intentions.

Despite ongoing advancements in fast-charging technology and battery innovations, consumer perceptions of charging speed remain challenging. While many consumers recognize the benefits of EVs, such as environmental sustainability and reduced fuel costs, their concerns about lengthy charging times deter them from making the switch [31, 34]. This study underscores the importance of attitude as a mediating factor, while shorter charging times improve attitudes toward EVs, these attitudes must be sufficiently strong to influence purchase decisions.

To overcome this challenge, strategic improvements in charging infrastructure should be prioritized. Governments and private stakeholders should expand the availability of fast-charging stations and integrate them into high-traffic urban and suburban areas. Developing ultra-fast charging technologies (e.g., high-power DC fast chargers) and battery-swapping solutions could significantly mitigate consumer concerns regarding charging time. Studies have shown that markets with widespread fast-charging accessibility experience higher EV adoption rates due to increased consumer confidence in charging convenience [35].

Furthermore, policymakers should consider incentivizing the installation of home and workplace charging solutions to reduce dependency on public charging stations. Research indicates that consumers with access to at-home charging solutions exhibit a significantly higher willingness to adopt EVs, as they are less affected by concerns over long public charging times [28].

Charging time significantly determines consumers' attitudes toward EVs, affecting purchase intention. While advancements in fast-charging technology and battery innovations continue, consumer perceptions regarding charging convenience remain a significant challenge. Policymakers and industry stakeholders must focus on expanding fast-charging infrastructure, promoting home charging accessibility, and investing in innovative charging solutions to address these concerns and drive broader EV adoption.

The price of EVs is a critical determinant of consumers' attitudes and, consequently, their intention to purchase. This study's findings confirm that price significantly indirectly

affects purchase intention through attitude. These results indicate that higher EV prices negatively influence consumers' attitudes, reducing the likelihood of purchasing.

Consumers typically assess EV prices relative to conventional ICE vehicles, and the higher upfront cost of EVs remains a significant barrier to adoption. Despite the long-term savings associated with lower fuel and maintenance costs, many consumers perceive EVs as expensive and financially inaccessible. Studies have shown that price sensitivity significantly shapes attitudes toward EVs, particularly in emerging markets where affordability is a key concern [27, 32]. This finding aligns with the UTAUT [11], emphasizing that cost barriers are fundamental in shaping consumer adoption of new technologies.

Furthermore, empirical research confirms the mediating role of attitude in the price-intention relationship. If consumers believe an EVs high price is justified by its quality, efficiency, and long-term savings, they may still maintain a favorable attitude and be more willing to purchase [37, 8]. However, when price concerns dominate consumer evaluations, negative attitudes often deter adoption, even when financial incentives are offered [45].

Government interventions and industry strategies must be implemented to mitigate the negative effect of high EV prices on consumers' attitudes. Studies suggest that subsidies, installment plans, and greater cost transparency can significantly improve consumer perceptions of EV affordability [12]. Additionally, promoting the long-term economic benefits of EV ownership, including reduced fuel dependency, lower maintenance costs, and tax incentives, can shift consumers' attitudes toward a more positive price perception.

A comprehensive pricing strategy should include a mix of financial incentives and consumer education programs. Government subsidies that reduce upfront costs, manufacturer rebates, and tax exemptions help bridge the affordability gap, making EVs more appealing to a broader market. Additionally, consumer education campaigns highlighting EVs cost savings over their lifetime, including fuel savings and minimal maintenance costs, can shift negative perceptions regarding their initial purchase price.

Price significantly influences consumers' attitudes toward EVs, shaping purchase intentions. While financial concerns remain a key barrier, they can be addressed through subsidies, installment plans, and educational initiatives. Given the decisive mediating role of attitude, efforts to enhance consumer perceptions of EV affordability will be critical to accelerating EV adoption and achieving a more sustainable transportation ecosystem.

The operating cost of EVs significantly influences consumers' attitudes, affecting intention to purchase. This study's findings confirm that operating costs significantly indirectly affect purchase intention through attitude. These results indicate that higher perceived operating costs negatively influence consumers' attitudes, ultimately reducing the likelihood of purchasing an EV.

Consumers typically evaluate the long-term financial implications of EV ownership, including electricity costs, maintenance expenses, and battery replacement costs, compared to conventional fuel-powered vehicles. When consumers perceive EVs as cost-efficient in the long run, they tend to develop a positive attitude toward adoption, increasing purchase intention [24, 27]. However, misconceptions regarding high maintenance costs, expensive battery replacements, and unreliable charging infrastructure contribute to negative attitudes, discouraging adoption [12].

Empirical research confirms that attitude is a mediating factor in the relationship between operating costs and purchase intention. If consumers are well-informed about the long-term savings of EVs, their attitude shifts positively, making them more likely to consider purchasing an EV [8, 45]. However, if consumers remain uncertain about actual operational costs, negative attitudes persist, preventing EV adoption.

To address consumer concerns, policymakers and manufacturers must focus on education and cost transparency. Providing clear cost comparisons between EVs and conventional vehicles and highlighting tax incentives, reduced fuel dependency, and lower maintenance expenses can positively shape consumers' attitudes [37]. Financial support mechanisms, such as battery replacement subsidies and government incentives for low electricity rates, can further enhance EV affordability perceptions.

Furthermore, ensuring reliable charging infrastructure and competitive electricity pricing will reduce range anxiety and improve cost-related perceptions. Research suggests that strengthening the public charging network and promoting home charging options can alleviate concerns about charging-related costs [36].

Operating costs are crucial in shaping consumers' attitudes toward EVs and influencing purchase intentions. While EVs offer long-term financial benefits, misconceptions and uncertainties regarding operational expenses remain key barriers to adoption. Addressing these concerns through consumer education, monetary incentives, and infrastructure improvements will be essential in fostering positive consumers' attitudes and accelerating EV market growth.

This study has extensively examined the role of incentives in influencing consumers' attitudes toward (EVs and their intention to purchase. The findings confirm that incentives significantly indirectly affect purchase intention via attitude. Although the impact of incentives is weaker compared to other factors, such as performance expectancy and environmental concern, it remains statistically significant, highlighting the importance of financial and policy-based interventions in promoting EV adoption.

Empirical evidence supports the assertion that financial incentives, such as tax rebates, direct subsidies, and reduced registration fees, are crucial in shaping consumers' attitudes toward EVs. Studies by Sierzchula et al. [39] and Lieven [38] have demonstrated that countries with strong government incentives experience higher EV adoption rates due to reduced upfront costs and improved affordability perceptions. These incentives effectively offset the financial burden associated with EV purchases, making them more attractive to consumers who high initial costs would otherwise deter.

Beyond monetary incentives, non-financial benefits also significantly influence consumer perceptions of EVs. Research indicates that policies such as free parking, road tax exemptions, and access to HOV lanes enhance the convenience and desirability of EV ownership [12]. These measures provide practical advantages that further reinforce positive consumers' attitudes, leading to a greater likelihood of purchase.

However, the effectiveness of incentives depends on consumer awareness and accessibility. If incentives are complex to claim, inconsistently applied, or perceived as insufficient, they may fail to produce the desired impact on consumers' attitudes. Research by Leurent and Windisch [43]

highlights that transparent and straightforward incentive programs are more effective in shaping consumer perceptions. This underscores the need for clear communication and simplified processes to ensure potential EV buyers fully understand and take advantage of available incentives.

To further enhance consumers' attitudes and drive EV adoption, policymakers should implement a comprehensive incentive strategy combining financial relief and convenience-enhancing policies. Expanding subsidy programs, increasing tax exemptions, and offering additional non-monetary benefits could strengthen positive consumers' attitudes toward EVs. Furthermore, public education campaigns should be conducted to raise awareness about available incentives, ensuring that consumers fully understand the cost-saving benefits of EV ownership.

Incentives play a significant role in shaping consumers' attitudes toward EVs influencing purchase intentions. While financial and non-financial incentives improve consumer perceptions, their effectiveness is contingent on awareness, accessibility, and perceived sufficiency. To maximize their impact, policymakers should focus on streamlining incentive programs, ensuring widespread awareness, and integrating non-monetary benefits. These efforts will reinforce positive consumers' attitudes and accelerate the transition toward sustainable mobility.

5. CONCLUSION

This study investigated the factors influencing urban Indonesian consumers' attitudes and purchase intentions toward EVs using the integrated frameworks of the TPB and the UTAUT. The results confirmed that environmental concern, performance expectancy, charging infrastructure, incentives, price, and operating costs significantly influence consumers' attitudes, which strongly predict purchase intention. Among these, performance expectancy and environmental concern emerged as the most influential positive drivers, while price and cost concerns were substantial deterrents.

The findings offer both theoretical and practical contributions. Theoretically, this study demonstrates the applicability of TPB and UTAUT in emerging market contexts, extending their relevance beyond developed countries with more advanced EV infrastructure. Practically, the results provide evidence-based insights for policymakers and automotive industry stakeholders in Indonesia: efforts to expand charging networks, communicate clear environmental benefits, and reduce cost-related barriers will be critical in accelerating EV adoption.

However, several limitations must be acknowledged. First, the study focuses exclusively on urban areas in the JADETABEK region, limiting the generalizability of findings to rural areas where infrastructure and consumer behavior may differ significantly. Second, the data were collected through an online self-reported survey, which may introduce selection bias and social desirability effects. Third, the study uses a cross-sectional design that captures consumers' attitudes at a single time without accounting for changes over time or actual post-purchase behavior.

To address these limitations, future research should consider (1) expanding the sample to include rural and peri-urban consumers across Indonesia; (2) incorporating mixed-method approaches such as in-person interviews or observational data to improve representativeness and accuracy; (3) conducting longitudinal studies to assess how attitudes and intentions evolve in response to policy or technological changes; (4) exploring additional variables such as brand perception, social influence, and trust in manufacturers; and (5) testing interaction effects, such as whether infrastructure availability moderates the impact of price, through multi-group or moderation analysis.

By highlighting the attitudinal mechanisms that mediate EV adoption in a developing country context, this study provides a valuable roadmap for advancing sustainable transportation policy and consumer behavior research in Indonesia and similar economies.

REFERENCES

[1] Purwanto, E., Irawan, A.P. (2023). Bibliometric analysis of electric vehicle adoption research: Trends, implications, and future directions. International Journal of Safety & Security Engineering, 13(5): 789-800. https://doi.org/10.18280/ijsse.130503

[2] Zhou, Y., Yang, H., Wang, Y., Yan, X.D. (2021). Integrated line configuration and frequency determination with passenger path assignment in urban rail transit networks. Transportation Research Part B: Methodological, 145: 134-151. https://doi.org/10.1016/j.trb.2021.01.002

[3] Sutopo, W., Nizam, M., Rahmawatie, B., Fahma, F. (2019). A review of electric vehicles charging standard development: Study case in Indonesia. In 2018 5th International Conference on Electric Vehicular Technology (ICEVT), Surakarta, Indonesia, pp. 152-157. https://doi.org/10.1109/ICEVT.2018.8628367

[4] Pirmana, V., Alisjahbana, A.S., Yusuf, A.A., Hoekstra, R., Tukker, A. (2023). Economic and environmental impact of electric vehicles production in Indonesia. Clean Technologies and Environmental Policy, 25(6): 1871-1885. https://doi.org/10.1007/s10098-023-02475-6

[5] Siahaan, A., Asrol, M., Gunawan, F.E., Alamsjah, F. (2021). Formulating the electric vehicle battery supply chain in Indonesia. TEM Journal, 10(4): 1900-1911. https://doi.org/10.18421/TEM104-54

[6] Widiawati, K., Sopha, B.M., Wardana, F.K. (2022). Public acceptance of electric vehicles in Indonesia. In 2022 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM), Kuala Lumpur, Malaysia, pp. 1301-1305. https://doi.org/10.1109/IEEM55944.2022.9989836

[7] Haustein, S., Jensen, A.F. (2018). Factors of electric vehicle adoption: A comparison of conventional and electric car users based on an extended theory of planned behavior. International Journal of Sustainable Transportation, 12(7): 484-496. https://doi.org/10.1080/15568318.2017.1398790

[8] Hoang, T.T., Pham, T.H., Vu, T.M.H. (2022). Examining customer purchase decision towards battery electric vehicles in Vietnam market: A combination of self-interested and pro-environmental approach. Cogent Business and Management, 9(1): 2141671. https://doi.org/10.1080/23311975.2022.2141671

[9] Maghfiroh, M.F.N., Pandyaswargo, A.H., Onoda, H. (2021). Current readiness status of electric vehicles in Indonesia: Multistakeholder perceptions. Sustainability

(Switzerland), 13(23): 13177. https://doi.org/10.3390/su132313177
[10] Ajzen, I. (1991). The theory of planned behavior. Organizational Behavior and Human Decision Processes, 50(2): 179-211. https://doi.org/10.1016/0749-5978(91)90020-T
[11] Venkatesh, V., Morris, M.G., Davis, G.B., Davis, F.D. (2003). User acceptance of information technology: Toward a unified view. MIS Quarterly, 27(3): 425-478. https://doi.org/10.2307/30036540
[12] Bennett, R., Vijaygopal, R. (2018). Consumers' attitudes towards electric vehicles: Effects of product user stereotypes and self-image congruence. European Journal of Marketing, 52(3-4): 499-527. https://doi.org/10.1108/EJM-09-2016-0538
[13] Miranda, J.L., Delgado, C.J.M. (2020). Determinants of electric car purchase intention in Portugal. Developments in Corporate Governance and Responsibility, 15: 161-172. https://doi.org/10.1108/S2043-052320200000015009
[14] GAIKINDO. (2024). Penjualan mobil listrik nasional naik, segmennya mencapai empat persen. https://www.gaikindo.or.id/penjualan-mobil-listrik-nasional-naik-segmennya-mencapai-empat-persen/.
[15] Febransyah, A. (2021). Predicting purchase intention towards battery electric vehicles: A case of Indonesian market. World Electric Vehicle Journal, 12(4): 240. https://doi.org/10.3390/wevj12040240
[16] Suzianti, A., Dewi, A.P., Mubarak, A., Shafira, N.D. (2020). Technology readiness level assessment of lithium battery in Indonesia for national electric vehicle program. AIP Conference Proceedings, 2227(1): 040010. https://doi.org/10.1063/5.0001010
[17] Alamsjah, F., Siahaan, A., Santoso, Y.A., Syahruddin, Handoko, D., Gunawan, F.E., Asrol, M., Redi, A.A.N.P., Persada, S.F. (2021). Potential factors affecting adoption of electric vehicle by Indonesia market. ICIC Express Letters, Part B: Applications, 12(11): 1081-1090. https://doi.org/10.24507/icicelb.12.11.1081
[18] Santoso, B., Wahyu Purwanto, W. (2021). Analysis on business development and pricing for electric vehicle charging in Indonesia. In Proceedings of the 2021 3rd International Conference on E-Business and E-Commerce Engineering, Sanya, China, pp. 102-107. https://doi.org/10.1145/3510249.3510269
[19] Ansab, K.V., Kumar, S.P. (2022). Influence of government financial incentives on electric car adoption: Empirical evidence from India. South Asian Journal of Business Studies, 13(2): 226-243. https://doi.org/10.1108/SAJBS-03-2021-0088
[20] Setiawan, A.D., Zahari, T.N., Purba, F.J., Moeis, A.O., Hidayatno, A. (2022). Investigating policies on increasing the adoption of electric vehicles in Indonesia. Journal of Cleaner Production, 380(2): 135097. https://doi.org/10.1016/j.jclepro.2022.135097
[21] Haryadi, F.N., Simaremare, A.A., Ajija, S.R., Hakam, D.F., Hadith Mangunkusumo, K.G. (2023). Investigating the impact of key factors on electric/electric-vehicle charging station adoption in Indonesia. International Journal of Energy Economics and Policy, 13(3): 434-442. https://doi.org/10.32479/ijeep.14128
[22] Moon, S.J. (2022). Effect of consumer environmental propensity and innovative propensity on intention to purchase electric vehicles: Applying an extended theory of planned behavior. International Journal of Sustainable Transportation, 16(11): 1032-1046. https://doi.org/10.1080/15568318.2021.1961950
[23] Chinen, K., Matsumoto, M., Liu, C., Tong, P., Han, ongliang S., Endo, H. (2023). Expanding electric-vehicle adoption beyond the national border: Insights for developing marketing policies for global electric-vehicle manufacturers. International Journal of Sustainable Transportation, 17(4): 393-405. https://doi.org/10.1080/15568318.2022.2045652
[24] Higueras-Castillo, E., Guillén, A., Herrera, L.J., Liébana-Cabanillas, F. (2021). Adoption of electric vehicles: Which factors are really important? International Journal of Sustainable Transportation, 15(10): 799-813. https://doi.org/10.1080/15568318.2020.1818330
[25] Renaud-Blondeau, P., Boisjoly, G., Dagdougui, H., He, S.Y. (2023). Powering the transition: Public charging stations and electric vehicle adoption in Montreal, Canada. International Journal of Sustainable Transportation, 17(10): 1097-1112. https://doi.org/10.1080/15568318.2022.2152403
[26] Gardian, P.I., Wardhana, A.R., Pramudita, R. (2023). Prediction of growing electric vehicle and battery production to nickel supply chain in Indonesia using system dynamics approach. AIP Conference Proceedings, 2517(1): 040004. https://doi.org/10.1063/5.0121171
[27] Purwanto, E., Irawan, A.P. (2024). The willingness to purchase electric vehicles: A comprehensive review. In IOP Conference Series: Earth and Environmental Science, 1324(1): 012091. https://doi.org/10.1088/1755-1315/1324/1/012091
[28] Gunawan, I., Redi, A.A.N.P., Santosa, A.A., Maghfiroh, M.F.N., Pandyaswargo, A.H., Kurniawan, A.C. (2022). Determinants of customer intentions to use electric vehicle in Indonesia: An integrated model analysis. Sustainability, 14(4): 1972. https://doi.org/10.3390/su14041972
[29] Alberto, J., Riza, F. (2023). Electrifying consumer choices: Unveiling the road to green intentions and EV adoption. Journal of Consumer Sciences, 8(3): 257-276. https://doi.org/10.29244/jcs.8.3.257-276
[30] Rizkalla, N., Tannady, H., Bernando, R. (2023). Analysis of the influence of performance expectancy, effort expectancy, social influence, and attitude toward behavior on intention to adopt live.on. Multidisciplinary Reviews, 6: e2023spe017. https://doi.org/10.31893/multirev.2023spe017
[31] Rasouli, S., Timmermans, H. (2013). Incorporating mechanisms of social adoption in design and analysis of stated-choice experiments: Illustration and application to choice of electric cars. Transportation Research Record, 2344(1): 10-19. https://doi.org/10.3141/2344-02
[32] Wang, L., Zhang, Q., Wong, P.P.W. (2022). Purchase intention for green cars among Chinese millennials: Merging the value-attitude-behavior theory and theory of planned behavior. Frontiers in Psychology, 13: 786292. https://doi.org/10.3389/fpsyg.2022.786292
[33] Schulze Darup, A., Piulachs, X., Guille, M. (2018). Consumer preferences for electric vehicles in Germany. International Journal of Transport Economics, XLV(1): 97-122. https://doi.org/10.19272/201806701006
[34] Junquera, B., Moreno, B., Álvarez, R. (2016). Analyzing consumers' attitudes towards electric vehicle purchasing

intentions in Spain: Technological limitations and vehicle confidence. Technological Forecasting and Social Change, 109: 6-14. https://doi.org/10.1016/j.techfore.2016.05.006
[35] Sriram, K.V., Michael, L.K., Hungund, S.S., Fernandes, M. (2022). Factors influencing adoption of electric vehicles–A case in India. Cogent Engineering, 9(1): 2085375. https://doi.org/10.1080/23311916.2022.2085375
[36] Zhang, X., Wang, K., Hao, Y., Fan, J.L., Wei, Y.M. (2013). The impact of government policy on preference for NEVs: The evidence from China. Energy Policy, 61: 382-393. https://doi.org/10.1016/j.enpol.2013.06.114
[37] Chu, W., Im, M., Song, M.R., Park, J. (2019). Psychological and behavioral factors affecting electric vehicle adoption and satisfaction: A comparative study of early adopters in China and Korea. Transportation Research Part D: Transport and Environment, 76: 1-18. https://doi.org/10.1016/j.trd.2019.09.009
[38] Lieven, T. (2015). Policy measures to promote electric mobility–A global perspective. Transportation Research Part A: Policy and Practice, 82: 78-93. https://doi.org/10.1016/j.tra.2015.09.008
[39] Sierzchula, W., Bakker, S., Maat, K., Van Wee, B. (2014). The influence of financial incentives and other socio-economic factors on electric vehicle adoption. Energy Policy, 68: 183-194. https://doi.org/10.1016/j.enpol.2014.01.043
[40] Jin, L.Z., Searle, S., Lutsey, N. (2014). Evaluation of state-level U.S. PEV incentives. International Council on Clean Transportation. https://www.theicct.org/sites/default/files/publications/ICCT_state-EV-incentives_20141030.pdf.
[41] Gass, V., Schmidt, J., Schmid, E. (2014). Analysis of alternative policy instruments to promote electric vehicles in Austria. Renewable Energy, 61: 96-101. https://doi.org/10.1016/j.renene.2012.08.012
[42] Kley, F., Wietschel, M., Dallinger, D. (2012). Evaluation of European electric vehicle support schemes. In Paving the Road to Sustainable Transport. Routledge, pp. 75-95. https://doi.org/10.4324/9780203119716-11
[43] Leurent, F., Windisch, E. (2011). Triggering the development of electric mobility: A review of public policies. European Transport Research Review, 3(4): 221-235. https://doi.org/10.1007/s12544-011-0064-3
[44] Lim, Y.J., Perumal, S., Ahmad, N. (2019). The antecedents of green car purchase intention among Malaysian consumers. European Journal of Business and Management Research, 4(2). https://doi.org/10.24018/ejbmr.2019.4.2.27
[45] Jaiswal, D., Kaushal, V., Singh, P.K., Biswas, A. (2021). Green market segmentation and consumer profiling: A cluster approach to an emerging consumer market. Benchmarking: An International Journal, 28(3): 792-812. https://doi.org/10.1108/BIJ-05-2020-0247
[46] Moons, I., De Pelsmacker, P. (2012). Emotions as determinants of electric car usage intention. Journal of Marketing Management, 28(3-4): 195-237. https://doi.org/10.1080/0267257X.2012.659007
[47] Sekaran, U., Bougie, R. (2016). Research Methods for Business: A Skill-Building Approach. John Wiley & Sons.
[48] Hair, J.F., Black, W.C., Babin, B.J., Anderson, R.E. (2009). Multivariate Data Analysis (7th ed.). Pearson.
[49] Purwanto, E., Sjarief, R., Dawan, A., Kurniawan, S., Pertiwi, N., Zahra, N. (2023). The acceptance of electronic payment among urban people: An empirical study of the C-Utaut-Irt model. Journal of Law and Sustainable Development, 11(2): e559. https://doi.org/10.55908/sdgs.v11i2.559
[50] Purwanto, E., Sjarief, R, Anwar, C. (2021). Driving and restricting factors of the behavior intention of the digital fishery platform adoption in new normal: Combine UTAUT-IRT model. Review of International Geographical Education (RIGEO), 11(8): 1089-1103. https://doi.org/10.48047/rigeo.11.08.93
[51] Sovacool, B.K., Abrahamse, W., Zhang, L., Ren, J. (2019). Pleasure or profit? Surveying the purchasing intentions of potential electric vehicle adopters in China. Transportation Research Part A: Policy and Practice, 124: 69-81. https://doi.org/10.1016/j.tra.2019.03.002
[52] Austmann, L.M., Vigne, S.A. (2021). Does environmental awareness fuel the electric vehicle market? A Twitter keyword analysis. Energy Economics, 101: 105337. https://doi.org/10.1016/j.eneco.2021.105337