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The Impact of Price Value, Driving Range, Charging Station Availability, and Monetary Incentive Policy on Intention to Buy Electric Vehicles in Jabodetabek-Indonesia

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Abstract: Adopting electric vehicles is crucial for reducing greenhouse gas emissions and dependence on fossil fuels. This study aims to address the gaps in the literature by examining the impact of price value, driving range, charging station availability, and monetary incentive policies on the intention to buy electric vehicles in Jabodetabek (Jakarta, Bogor, Depok, Tangerang, Bekasi), Indonesia. This research is quantitative and applies purposive sampling methods. 255 respondents were obtained through Google forms distributed online through WhatsApp, Messenger, Line, Twitter, and Email. Data analysis using Smart PLS. There are four independent variables: price value, driving range, charging station availability, and monetary incentive policy. The independent variable is the intention to buy electric vehicles. The results show that price value, driving range, and charging station availability significantly influence the intention to buy electric vehicles. Meanwhile, monetary incentive policies do not have a significant impact. The results of this research can provide valuable input to producers and regulators. Future research can involve a broader population and simultaneously test other potential factors from previous studies to find fundamental aspects that can assist decision-makers in taking appropriate actions to encourage the adoption of electric vehicles.

Keywords: Price value, Driving range, Charging station availability, Monetary Incentive Policy, Intention to Buy Electric Vehicles

I. Introduction

Electric vehicles (EVs) have received significant attention in recent years because of their potential to reduce greenhouse gas emissions and their dependence on fossil fuels. The transition to electric vehicles continues to overcome environmental problems that are allegedly caused by vehicles with traditional combustion systems[1][2].Research conducted by [3] showed that electric vehicles with renewable energy can significantly reduce harmful gas emissions, contributing to cleaner air and a healthier environment. Therefore, it is understandable that policymakers and stakeholders strive to facilitate the electric vehicle transition to create better environmental conditions [3][5].

In the Indonesian context, understanding the factors that encourage consumers to purchase electric vehicles (EVs) is very important, considering the large potential market for electric vehicles in this country. According to Indonesian Data (2023), electric vehicle sales in October 2023 reached 537,587 units, an increase of 1.24% from the previous month of 516,293 units. Therefore, understanding the factors influencing the intention to purchase electric vehicles in Indonesia is important for the successful adoption of this technology.

Previous research identified several factors that influence electric vehicle purchase intention. However, research regarding this in the Indonesian context still needs to be conducted. Based on literature, this research identifies several factors that have the potential to influence consumers' intentions to purchase electric vehicles (EV).

Research conducted by[6]explained the importance of competitive prices, government incentives, and the development of charging infrastructure to increase public acceptance of electric vehicles in Indonesia. Interestingly, [7] found that consumer attitudes do not significantly affect adoption intentions.[6][8] underline the role of government support and the development of charging infrastructure as essential factors in encouraging the adoption of electric vehicles.[9] identified infrastructure and regulatory barriers, emphasizing the need for strategic investment, comprehensive policy support, and public engagement to facilitate electric vehicle adoption.

Prior studies also show that purchase price is an important factor, because consumers are sensitive to the initial cost of electric vehicles[10][11]. Driving distance and performance aspects such as speed and safety are also important considerations for potential buyers[11]. Interestingly, although several studies show that the availability of charging infrastructure is not a significant concern for consumers in certain regions [10][11], research conducted by[12] and [13] shows that charging time and the availability of charging stations do not have much influence.

In addition, monetary incentive policies such as purchasing subsidies have been shown to stimulate price-sensitive consumers' purchasing preferences [14]However, their long-term effectiveness needs to be improved. Interestingly,[15] showed that financial incentives are not always the most important factor influencing purchase intentions.

Based on the above explanation, although price value and driving range are important factors for users, the impact of the availability of charging stations and monetary incentive policies can vary. Policymakers and vehicle manufacturers must consider these factors to encourage electric vehicle adoption effectively.

Understanding the factors that influence electric vehicle purchase intention in Indonesia is critical for the successful adoption of this technology. From the literature, it can be concluded that several factors, such as initial purchase price, improving vehicle performance, and ensuring the availability of charging infrastructure, as well as carefully designed incentive policies, can support increasing consumer intentions to purchase electric vehicles[10][14][12].

Although the factors influencing the intention to purchase Electric Vehicles (EV) in Indonesia have been discussed in several previous studies, there are still gaps in the literature. This research aims to examine how factors such as price value, driving range of electric vehicles, availability of charging stations, and monetary policy influence the intention to Buy Electric Vehicles.

II. Literature Review and Hypothesis Development

Scholars often use the Theory of Planned Behavior (TPB) and the Technology Acceptance Model (TAM) to understand consumer behavior towards electric vehicles (EVs).These models show that consumers' intention to purchase an electric vehicle can be influenced by various factors including price value, distance traveled, availability of charging stations, and monetary incentive policies.

Price value is an essential factor because it includes the perception of a product's value compared with its cost [16]. Driving range is another important consideration, as it reflects the distance an electric vehicle can travel on a single charge, influencing consumer confidence in its usability [17][11]. The availability of charging stations directly influences the perceived ease of use and convenience, which are important for adoption[18].

Meanwhile, monetary incentive policies such as subsidies can significantly reduce the effective price of electric vehicles, thereby increasing purchase intentions[19];[20]. Contradictions and interesting facts emerged when comparing the importance of these factors in different contexts. For example, although monetary incentives were shown to have a significant positive influence in China[21], they did not show a significant relationship with willingness to purchase electric vehicles among the younger generation in Thailand [10]. Likewise, the existence of infrastructure supporting the existence of EVs is not that significant compared to the price factor in China [19]. However, in Thailand, consumers do not really care about infrastructure[11].

Thus, the intention to purchase an electric vehicle is multifaceted, with price and mileage generally considered significant determinants across markets. The availability of charging stations is critical, although their importance varies by region. Monetary incentive policies may be effective, but their impact is not uniform and may depend on other factors such as consumer attitudes and vehicle ownership. Based on the explanation above, to test the relationship between these factors and the intention to Buy Electric Vehicles, four hypotheses were developed as belows.

2.1 Relationship between price value and intention to buy electric vehicles

In the Indonesian context, the adoption of electric vehicles is still in its infancy; at this stage, it is indicated that consumers' purchasing intentions are influenced by factors such as emotions, functionality, car identity, and cost of ownership, including price value[22].Although this study does not explicitly explain the direct correlation between price value and consumer purchase intentions, it can provide insights into the fact that price is an essential factor that determines purchase intentions for electric vehicles.

In research conducted by[10] among young consumers in Thailand, purchase price was identified as a key factor influencing the younger generation's intention to purchase electric vehicles, with the implication that vehicle manufacturers need to lower the initial purchase price to attract interest among this group. Likewise, in Malaysia, the high battery replacement price is one reason for the low desire to buy electric vehicles [23]. Meanwhile, in India, price perceptions significantly influence consumer attitudes towards electric vehicles [24].

Previous research has presented many analyses on the importance of price as an important variable in the adoption of electric vehicles in various markets. As in other regions, it can be concluded that price value is likely to play an essential role in shaping consumer intentions to buy electric vehicles in Indonesia, and the following hypothesis can be formulated:

H1: There is a significant relationship between price value and intention to purchase electric vehicles.

2.2 Relationship between driving range and intention to buy electric vehicles

The relationship between Driving Range and intention to purchase an electric vehicle (EV) in Indonesia has not been widely discussed in the literature. However, research conducted by [25] in Bahrain could be different in that they found that the driving range has little impact on consumers' intention to buy electric vehicles. This suggests that factors other than distance traveled influence electric vehicle purchase intentions more in specific markets. Interestingly, although driving distance is a common concern in electric vehicle adoption, it seems that in some contexts, other factors such as emotion, functionality, cost of ownership, and identity of the car, as well as environmental awareness and purchase price, are more important to consumers, as well as environmental awareness and purchase price [22].

Additionally, research conducted by [25] further highlighted the importance of consumer awareness and purchasing power.[26] believe that personal values such as materialism and ecological awareness influence intentions to purchase electric vehicles. In short, previous research has not directly analyzed the relationship between Driving Range and intention to purchase electric vehicles in Indonesia. Testing the relationship between Driving Range and electric vehicle adoption in the Indonesian market will provide a better understanding of consumer preferences[25].Based on this description, the following hypothesis was formulated:
H2: There is a significant relationship between driving range and intention to buy an electric vehicle.

2.3 Relationship between the availability of charging stations and intention to buy an electric vehicle.

The relationship between the availability of charging stations and intention to purchase an electric vehicle in Indonesia has many aspects.[27] highlighted that the distribution of charging stations has a positive effect on the purchase intention of electric cars among potential consumers. The study also notes that consumer aspirations for charging stations include a desire for wide availability at strategic points and complementary facilities.

[22] research focus on Indonesia estimates that there is moderate purchase intention toward battery electric vehicles (BEVs) among early consumers who are wealthy and highly educated. However, they did not explicitly link this to the availability of charging stations. In contrast, in the Indonesian context, [28] did not find a significant relationship between perceptions of electric vehicle infrastructure, such as charging stations, and the intention to purchase electric vehicles.

In summary, although there is evidence to suggest that the availability of charging stations can have a positive impact on the intention to purchase electric vehicles in Indonesia[27], this relationship is not uniformly supported across the literature; therefore, research is needed to clarify the extent of the impact of charging infrastructure power on the adoption of electric vehicles in Indonesia. Based on this description, the following hypothesis is formulated:
H3: There is a significant relationship between the availability of charging stations and intention to purchase electric vehicles in Indonesia.

2.4 Relationship between monetary incentive policies and electric vehicle (EV) purchase intention

Monetary incentives are generally believed to encourage EV adoption of electric vehicles, and previous studies have presented different facts.[7] suggest that attitudes that can be influenced by monetary incentives have an insignificant influence on adoption intentions. In contrast, other factors, such as subjective norms, perceived behavioral control, environmental concerns, and moral norms, significantly predicted electric vehicle adoption intentions in Indonesia.

By contrast, [12] found that financial incentives influence the intention to purchase an electric vehicle. This is in line with the study by [25] in Bahrain, who found that government financial incentives, such as tax exemptions, can encourage the purchase of electric vehicles. This finding indicates that the effectiveness of monetary incentives may vary by region and consumer demographics.

In short, although monetary incentives can be a policy component aimed at increasing EV adoption of electric vehicles, their direct impact on purchase intentions in Indonesia may be less significant than other factors. Based on this description, the following hypothesis was formulated:
H4: There is a significant relationship between monetary incentive policies and intention to purchase electric vehicles in Indonesia.

Based on the explanation above, Figure 1 presents the theoretical framework of this study, which explains the relationships among variables.

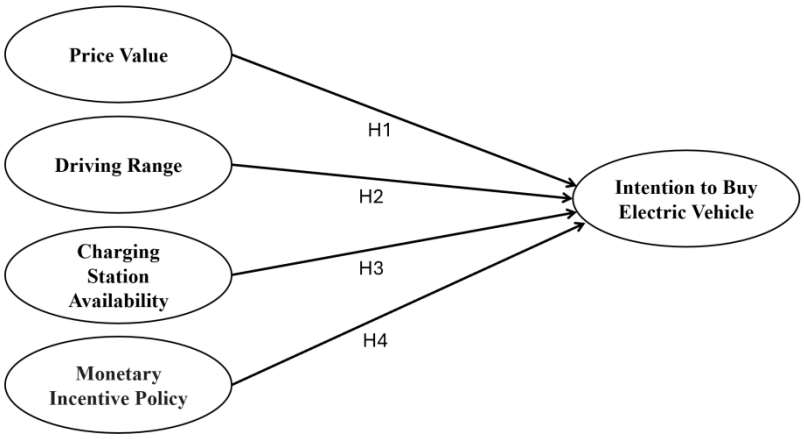

Figure 1 theoretical framework

III. Methodology

This study aims to identify variables that can affect customers' intention to Buy Electric Vehicles in Indonesia. The research is quantitative in nature, with data obtained cross-sectionally, namely only observing once and measuring subject variables at the time of the study. This study used four independent variables: price value (PV), driving range (DR), charging station availability (CS), and Monetary Incentive Policy (MI).The independent variable is the Intention to Buy Electric Vehicles (IN).The PV measurement items were adapted from[29]. The DR items were adapted from the indicators mentioned by[30], CS items were adapted from the indicators mentioned by [11].The MI items were adapted from the indicators mentioned by[14][31]. In contrast, the IN items measured from the indicators mentioned by [31][24].All items were measured using a 1-5 Liker scale (1=strongly agree, 2=agree, 3=neutral, 4=disagree, 5=strongly disagree).

This study used SMARTPLS 3.2.9 software to run the data collected through the Google survey questionnaire. The choice of PLS-SEM is in accordance with the research objectives of exploring theoretical extensions of existing theories, as stated by [32]. Data were collected through an online survey questionnaire using Google Forms with a purposive (judgmental) sampling method, as judgmental samples select participants who are in the best position to offer the desired information. The sample requirements in this study were as follows: 1) age 17 years and over. 2) bought an electric vehicle. Meanwhile, according to [33], the minimum sample size should be "ten times the largest number of formative indicators used to measure a construct". According to these rules, the 255 samples collected in this study met the minimum sample size criteria for running PLS-SEM.

IV. Data Analysis

A total of 255 respondents were obtained through Google forms that were distributed online through WhatsApp, Messenger, Line, Twitter and Email. Of these, 201 (79%) were male, while only 54 (21%) were female. While the largest age group in a row was occupied by the age group 31-40 years as many as 118 (46%), followed by the age group 41 years and over as many as 89 (35%), the last was occupied by the age group 21 - 30 years as many as 48 (19%).

Furthermore, in terms of the highest level of education, 27 (10%) respondents had postgraduate qualifications, 117 (46%) had bachelor's degrees, and 96 (38%) had academies and equivalent qualifications. Only 15 (6%) had high school diplomas and the equivalent. Meanwhile, the respondents' occupations included 133 (52%) people working as entrepreneurs, 76 (30%) as private / BUMN employees, 27 (11%) as civil servants, while 19 (7%) were included in the "others" profession criteria. The domicile of the respondents is 98 (38%) people in Jakarta, this number is the largest, Bogor 37 (15%), Depok 41 (16%), Tangerang 51 (20%), and Bekasi 28 (11%).

The next step after analyzing the sample demographics above is to analyze the data using SmartPLS 3.0 [34] as a tool to test the measurement and structural models. As suggested by [35], to test the developed research model, it was conducted in two steps. First, a measurement model test was conducted to examine the validity and reliability of the instrument, as suggested by [32]. The second step is to conduct a structural model test to test the hypotheses developed previously.

4.1 Measurement Model Assessment

In this section, measurements are taken successively based on the following values of the factor loading values: > 0.7, the average variance extracted (AVE) value is > 0.5, the composite reliability value is > 0.7, and the Cronbach alpha value is > 0.7.In this process, several questionnaire items had to be eliminated because they had factor loading values <0.7, namely PV4, DR1, DR6, DR7, MI1, and IN4.Furthermore, in Table 1, all criteria that have met the requirements are presented so that it can be concluded that the construct meets the requirements for reliability and convergent validity.

Tabel 1. Measurement Model

Construct	Item	Loading	AVE	CR	Alpha
Price value	PV1	0.756	0.601	0.873	0,868
	PV2	0.770			
	PV3	0.810			
	PV5	0.731			
	PV6	0.801			
Driving range	DR2	0.771	0.711	0.761	0.778
	DR3	0.767			
	DR4	0.702			
	DR5	0.810			
Charging station availability	CS1	0.780	0.759	0.834	0.792
	CS2	0.860			
	CS3	0.821			
	CS4	0.798			
	CS5	0.765			
Monetary Incentive Policy	MI2	0.786	0.767	0.707	0.865
	MI3	0.811			
	MI4	0.765			
	MI5	0.863			
Intention to Buy Electric Vehicles	IN1	0.752	0.656	0.810	0.812
	IN2	0.785			
	IN3	0.851			
	IN5	0.773			

The next step was to assess the discriminant validity criteria using Fornell and Larker (1981).In SEM-PLS, the model has good discriminant validity if the square root of the AVE for each construct is greater than the correlation value between the two constructs. In Table 2, the square root of the AVE value for each construct is greater than the correlation estimates of the factors; therefore, it can be concluded that these values meet the requirements that the measurement items are both valid and reliable.

Table 2 Discriminant Validity

	1	2	3	4	5
1. Price value	0.775				
2. Driving range	0.670	0.843			
3. Charging station availability	0.567	0.677	0.871		
4. Monetary Incentive Policy	0.674	0.675	0.711	0.876	
5. Intention to Buy Electric Vehicles	0.711	0.560	0.665	0.579	0.702

4.2 Struktural Model Assessment

The structural model describes the connections between constructs .In this section, the results of the hypothesis test proposed in this study and the R^2 values are presented. The results of hypothesis testing show that there are three significant hypotheses: price value ($\beta = 0.139$, $p < 0.05$), driving range ($\beta = 0.855$, $p < 0.05$), and charging station availability ($\beta = 0.211$, $p < 0.05$) were significantly related to intention to Buy Electric Vehicles, while monetary incentive policy was not supported.

The R^2 value in this study was 0.273.This means that all independent variables explained 27.3% of the Buy Electric Vehicles. The complete results of the hypothesis testing are shown in Table 3.

Table 3. Hypothesis test results

Hypothesis	Beta	Std Dev	p Value	Information
1. Price value → Intention to Buy Electric Vehicles	0,139	0,633	0.001	Significant
2. Driving range → Intention to Buy Electric Vehicles	0,855	0,466	0,000	Significant
3. Charging station availability → Intention to Buy Electric Vehicles	0,211	0,222	0,000	Significant
4. Monetary Incentive Policy → Intention to Buy Electric Vehicles	- 0,023	0,374	0,427	Not significant

V. Conclusion and Future Research

This study investigates the impact of price value, driving range, charging station availability, and monetary incentive policies on the intention to buy electric vehicles (EVs) in Jabodetabek, Indonesia. Previous research has identified these factors as influencing consumer purchase intentions for EVs; however, there is a lack of research specific to the Indonesian context. Indonesia has significant potential as a market for EVs and is one of the largest automotive markets in the world. Therefore, understanding the factors driving EV adoption in Indonesia is crucial for a successful transition to this technology.

The results show that price value, driving range, and charging station availability have a significant influence on the intention to buy electric vehicles. Meanwhile, monetary incentive policies did not have a significant impact. This means that these three factors, namely price value, driving range, and charging station availability, are highly recommended by manufacturers and related parties to support the adoption of electric vehicles that are currently being encouraged by the government. In other words, the portion of attention paid to these three will be able to encourage consumers to buy electric vehicles.

Meanwhile, factors related to monetary incentive policies do not have a significant influence on the intention to buy electric vehicles (EVs) in Jabodetabek. This is, of course, an important point because currently, monetary incentives are one of the instruments considered important by the government to encourage society's transition from using fossil fuels to electric vehicles. This finding proves that aspects related to providing monetary incentives to consumers, which are often thought to encourage them to buy electric vehicles, have not been proven in research. Furthermore, various efforts continue to be made by manufacturers and governments to encourage the public to use electric vehicles by the public. The existence of information validated by this research is significant. At least thorough knowledge of the factors driving consumer intention to buy electric vehicles. Relevant parties can focus more and pay attention to these important factors.

In addition, for further research, it is important to review previous relevant research to get a better picture of the extent to which factors can provide applicable solutions to the EV problems. Future research can involve a wider consumer population and test those factors simultaneously to find fundamental aspects to assist producers and decision-makers in taking appropriate actions for successful electric vehicle adoption in Indonesia.

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