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Customer Preference Analysis on Attributes of Hybrid Electric Vehicle: A Choice-based Conjoint Approach

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ABSTRACT: Hybrid Electric Vehicle (HEV) have been introduced on the Indonesian market since the 2000s in an effort to minimize emissions from the country's automotive industry. Using a conjoint analysis approach, the objective of this study was to determine the most preferred combination of HEV attributes. This study assessed whether a variety of attributes, such as (1) vehicle pricing, (2) driving range, (3) consumption level, (4) emission level, and (5) HEV policies, had the most influence on purchasing decisions. A conjoint analysis and a choice-based survey design were utilized to determine respondents' preferences for HEV. The results revealed that price was the attribute that influenced respondents' purchase decisions the most (39,7%), followed by policy (22%), emission (15,9%), consumption (13,7%), and driving range (8,7%) being the least preferred. Automotive companies will benefit from the findings of this study about customer preferences for HEV attributes. Lastly, the findings of this study can be used to research electric vehicles conducted around the world.

KEYWORDS: Conjoint Analysis, Choice-based, Customer Preference, Hybrid Electric Vehicle, Purchase Decision.

I. INTRODUCTION

Carbon dioxide (CO2) emissions threaten humanity. The International Energy Agency (IEA) reported 36.3 Gigatons (Gt) of CO2 emissions in 2021. This exceeds 2020's record for highest carbon emissions by about 6% [1]. According to the World Meteorological Organization (WMO), greenhouse gas (GHG) emission concentrations are growing and will exceed record levels by 2021 [2]. The WMO predicts increased harsh weather due to rising GHG emissions. There may have wide-ranging social and economic effects. By keeping the global temperature rise to 2°C to 1.5°C, over pre-industrial levels, climate change can be prevented. The Paris Agreement, ratified by 200 nations between April 2016 and April 2017, pledged to cut gas emissions to lessen global carbon emissions [3].

As part of the global accord, Indonesia also reaffirmed its Nationally Determined Contribution (NDC) pledge to cut GHG emissions by 41% with international assistance and 29% on business as usual (BAU) by 2030 [4]. Then, by 2060, Indonesia likewise intends to achieve carbon neutrality, or net zero emissions (NZE). Energy accounted for 45.7% of carbon emissions, followed by electricity generation at 35% and transportation at 27%, according to the Ministry of Industry Indonesia [5]. The government hopes the growth of the environmentally friendly automotive industry in this area would support the carbon emission reduction target. Thus, the transportation industry may lead a transition by developing electric vehicles and a green ecosystem.

Indonesia's Ministry of Industry recognizes that the government favors electrification by drafting a regulation to grow the electric vehicle industry [6]. Presidential Regulation 55 of 2019 is an example [7]. The Battery-based Electric Motor Vehicle (KBLBB) program for highway mobility is accelerated, including electric vehicle (EV) incentives, and charging infrastructure. Next comes KBLBB's electricity pricing regulation, technical standards, and ultimately, environmental preservation.

As a regulator, the government of Indonesia encourages automakers and industry to develop the technology in exchange for a reduction in the country's emissions due to citizens' use of electric vehicles. Industry should develop new electrified vehicle technology and its ecosystem to enhance demand for electric vehicles and market share. Customers will use electrified vehicle technology to profit from cutting-edge technology and help the environment. These 3 groups must cooperate to electrify Indonesia.

Since 2009 through the Toyota Prius, Hybrid Electric Vehicles (HEV) have been available on the Indonesian market as an environmentally friendly electric vehicle with reduced emissions and greater fuel efficiency [8]. HEVs automatically select the best power source and combine (view Figure 1). This mode uses a fuel-efficient conventional engine and a zero-emission electric motor to anticipate the limited infrastructure for charging electric car batteries [9]. Because it does not depend on battery capacity, which

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always obtains electricity from conventional engines, it is more versatile. This electric vehicle is simple to operate and more affordable than one with a full electric battery (e.g., Battery Electric Vehicle/BEV).

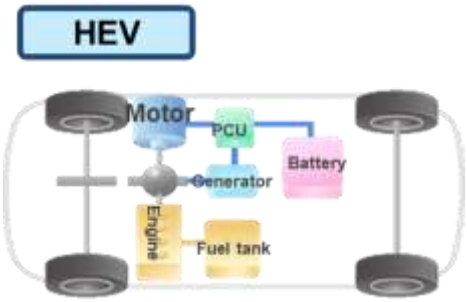

Figure 1. Toyota's Hybrid Electric Vehicle. Adapted from: [9]

According to The Association of Indonesia Automotive Industries (GAIKINDO), HEV sales keep increasing each year [Figure 2 & 10]. However, compared to Internal Combustion Engine (ICE) or conventional vehicle sales, Indonesian electric vehicle sales are relatively small. Domestic EV sales are still far below the Indonesian government's target of 20% electrification by 2025 in Indonesia [5].

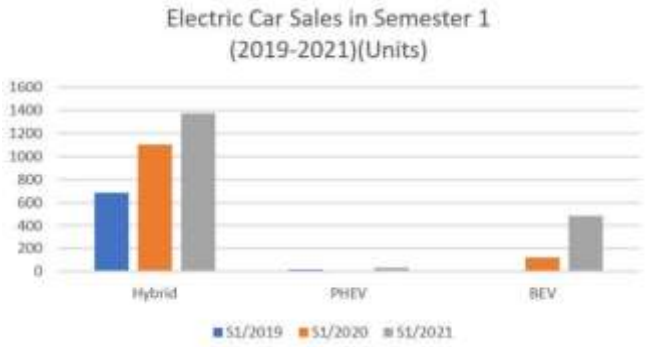

Figure 2. Indonesian adoption of electric vehicles. Adapted from: [10]

The majority of efforts to increase EV market penetration have focused on technological improvement, while modeling techniques' ability to stimulate EV sales is often disregarded in academic research and public policy formation [11]. Christian Adisaputra examined how product quality, pricing, distribution, and advertising affect Honda Car brand preferences. His study of 110 Indonesians demonstrated that product quality, pricing, distribution, and promotion modestly affect Honda automobile customer preferences [12].

Gautam Raj Kumar investigated the purchasing decision of Indian customers, concentrating on the attributes that influence car purchases. It has been established that safety, appearance, shape, features, interior image, and pre-sales and after-sales policies encouraged the customer to choose and acquire the vehicle [13]. Sangeeta Gupta examined New Delhi passenger vehicles purchasing attributes. Price and fuel economy affect purchasing decisions [14]. In 2022, Imran Ali and Mohammad Naushad research what drives electric vehicle adoption. The study found that pricing impacts electric vehicle adoption [15].

J. Selva and R. Arunmozhi examines customer preferences by assessing electric vehicle financial, technological, infrastructure, and regulatory attributes. Performance, social impacts, and warranties appear to benefit electric vehicles. Policy discourages the electric industry. Electric vehicle range and environmental friendliness are also inadequate [16-17]. Shao-Chao Ma et al. use big data and text analytics to study the online EV selection behavior of a large number of Chinese customers. EV costs, vehicle categorization, and engine types influenced customer response most [18].

Yongyou Nie et al. discovered that customers in Shanghai chose hybrid cars with a cheaper pricing, higher maximum speed, faster recharging, greater driving distance, reduced pollution, and lower gasoline costs [19]. Fanchao Liao, Eric Molin, and Bert van Wee evaluate EV customers' preference studies to advise policymakers and future research. Socioeconomic attributes, psychological

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characteristics, mobility conditions, and social impact shaped customer preferences [11]. In 2019, they also found that business models and technology may both affect electric vehicle market penetration [20].

Yong Hoe Hong, Nasreen Khan, and Muhammad Madi Abdullah examine demographic determinants and Malaysians' hybrid vehicle adoption intentions. Coded and analyzed 107 acceptable respondents. Males with better incomes, with higher education, and those between 29 and 39 are more likely to buy hybrid vehicles in Malaysia [21].

To distinguish between the vehicles, certain attributes have to be chosen. The selection of criteria was based on an interview with a practitioner and previous studies aiming to determine the most important attributes for consumers when purchasing an electric vehicle. The responses were evaluated to determine how often each criterion was cited (merging different designations for the same aspect). Within the most prevalent attributes, (1) purchasing price, (2) traveling range, (3) gasoline consumption, and (4) carbon emissions were chosen because they distinguished meaningfully between the drive systems of electric vehicles. Other often suggested factors, such as comfort and appearance, were not chosen because they did not distinguish the powertrains. In addition to these criteria, the survey also included the opportunity for EV owners to receive special privileges in order to assess the efficacy of these (5) policies (existing in Indonesia). The chosen criteria are among those most often used in studies assessing customer preferences for EVs [11 & 15-20]. Figure 3 depicts the conceptual framework for this study.

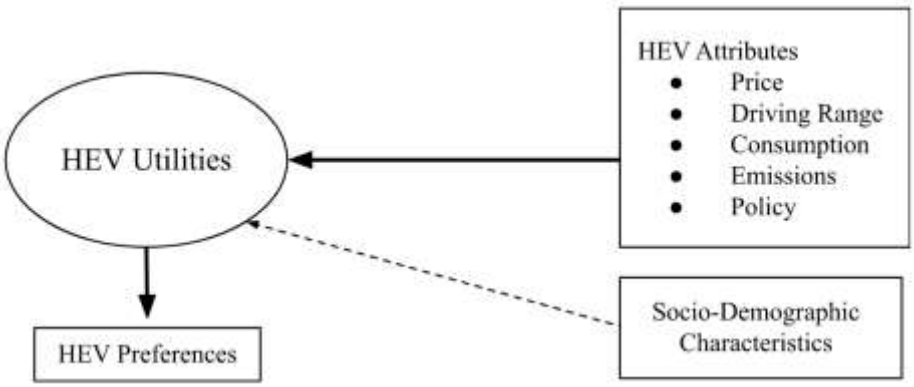

Figure 3. Conceptual framework for HEV preferences. Adapted from: [11 & 15-20]

Using dis-aggregate models (Conjoint Analysis) to reflect consumer preferences is the most typical approach to collecting stated preference data [22]. The ability of these approaches to forecast the demand for new products [23] and the ability to analyze in depth the product attributes prior to their debut to the market [24] are cited as the primary grounds for this selection. The present paper contributes to this collection of information by comparing a wide range of Hybrid Electric Vehicles (HEV) and by concentrating on the Indonesian market.

This study attempted to determine the combination of HEV attributes that were most preferred by the customers using a Conjoint Analysis Approach. Specifically, this analysis employed a set of attributes, including price, driving range, fuel consumption, emissions, and policy. To examine the preference of HEV among customers, a conjoint analysis with a choice-based survey design was utilized. The conclusions of this study will be valuable to electric vehicle companies involving customer preferences about the various attributes of a HEV. In addition, the findings of this study may be applicable to other countries with an emphasis on electric vehicles.

II. METHODOLOGY

A. Respondents

This survey, which will collect data through the use of random sampling, is recommended to have a minimum of 200 participants by Malhotra [25]. Access to the online survey was available beginning on November 8 and ending on November 14 in 2022. There was a total of 215 eligible Indonesian respondents who either already own a private vehicle or have plans to purchase one in the near future and participated to the survey's 21 combined attribute questions about their preferences for HEVs.

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B. Demographic Details

Table I displays the study's demographic information. Among the 215 responders from Indonesia, 59.07% were men and 40.93% were women. The majority of responders were between the ages of 26 and 35 (73.2%). The remaining respondents were between the ages of 18 and 25 (20.47%), above 45 (4.19%), and 36 to 45 (2.33%). More than half of respondents (56.74%) are unmarried, while the remainder are married (43.26%). Jakarta (33,02%) and Bandung (33,02%) accounted for many respondent's domiciles, with Tangerang (10,7%), Bekasi (8,37%), Bogor (3,72%), Surabaya (3,26%), Depok (1,4%), and other cities (6,51%) accounting for the remainder. Most respondents work as private employees (45.12%), entrepreneurs (19.53%), students (12.09%), government workers (5.58%), housewives (5.12%), and other activities (12.56%). Approximately (46,51%) of the respondents earned less than 10 million IDR each month. Other respondents' monthly income ranged from 10 to 20 million IDR (39.7%), 20 to 30 million IDR (6.51%), and over 30 million IDR (7.91%).

Table I. The respondents' descriptive statistics (n = 215)

Characteristics	*Category*	*n*	*%*
Gender	Men	127	59,07%
	Women	88	40,93%
Age	18 – 25 years old	44	20,47%
	26 – 35 years old	157	73,2%
	36 – 45 years old	5	2,33%
	> 45 years old	9	4,19%
Marital Status	Married	93	43,26%
	Unmarried	122	56,74%
Domicile/Location	Jakarta	71	33,02%
	Bogor	8	3,72%
	Depok	3	1,4%
	Tangerang	23	10,7%
	Bekasi	18	8,37%
	Bandung	71	33,02%
	Surabaya	7	3,26%
	Others	14	6,51%
Profession/Activity	Government Employee	12	5,58%
	Private Employee	97	45,12%
	Entrepreneur	42	19,53%
	Student	26	12,09%
	Housewife	11	5,12%
	Others	27	12,56%
Earnings - monthly	< 10 million IDR	100	46,51%
	10 million IDR – 20 million IDR	84	39,07%
	20 million IDR – 30 million IDR	14	6,51%
	> 30 million IDR	17	7,91%

C. Choice-based Conjoint Design

The experimental attributes of HEV are outlined in Table II. This study compared the prices of HEVs (500 million IDR, 650 million IDR, and 800 million IDR), the driving range of HEVs (800 km, 900 km, and 1,000 km), the consumption of HEVs (65,000 IDR/100km, 75,000 IDR/100km, and 85,000 IDR/100km), the emissions of HEVs (110 g/km, 120 g/km, and 130 g/km), and the policy regarding HEVs (reserved parking spot, odd-even regional road regulation, government tax incentives). Within the scope of this study, a total of 5 attributes and 3 levels were evaluated.

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Table II. Attributes levels for experimental design

Attribute	*Level 1*	*Level 2*	*Level 3*
Price	500 million IDR	650 million IDR	800 million IDR
Driving Range	800 km	900 km	1.000 km
Consumption	65.000 IDR/100km	75.000 IDR/100km	85.000 IDR/100km
Emission	110 g/km	120 g/km	130 g/km
Policy (Privilege)	Reserved parking spot	Odd-even regional road regulation	Government tax incentive

To determine the pricing at the price level, the study examines existing HEV products on the Indonesian market, searching for the cheapest product, followed by the most expensive, and selecting the intermediate product as a sample. Thus, prices of 500 million IDR, 650 million IDR, and 800 million IDR were determined and evaluated by survey respondents. In addition to obtaining the levels of attributes on the driving range, consumption level, and emission level, the same sample product is used for the references. This is done for consistency.

The determination of level 1 in government policy, namely reserved parking spots, is based on the prior research, which includes free parking as one of the research considerations [26]. The level 2 policy, namely the ability to drive vehicles with both odd and even license plates, is derived from the Jakarta local government policy exempting electric vehicles from these regulations [27]. The level 3 policy is the Indonesia government's policy to encourage electric car ownership through vehicle tax incentives [7].

D. Statistical Analysis

Utilizing *Survey Analytics*®, the conjoint analysis with a choice-based design was conducted. 21 stimuli were generated by *Survey Analytics*®. The choice-based approach was implemented to ensure that responders examined a sufficient number of stimuli. Table III lists the 21 stimuli that were tested. Then, 7 groups with 3 option choices each were assigned to each respondent.

Table III. Stimulus

Combination	*Price*	*Range*	*Consumption*	*Emission*	*Privilege*
1	500 million IDR	800 km	65.000 IDR/100 km	110 g/km	Reserved Parking
2	650 million IDR	900 km	75.000 IDR/100 km	120 g/km	Odd-even Regulation
3	800 million IDR	1.000 km	85.000 IDR/100 km	130 g/km	Tax Incentive
4	650 million IDR	800 km	85.000 IDR/100 km	120 g/km	Reserved Parking
5	800 million IDR	900 km	75.000 IDR/100 km	120 g/km	Odd-even Regulation
6	650 million IDR	1.000 km	75.000 IDR/100 km	110 g/km	Reserved Parking
7	650 million IDR	900 km	65.000 IDR/100 km	130 g/km	Tax Incentive
8	650 million IDR	900 km	75.000 IDR/100 km	120 g/km	Tax Incentive
9	500 million IDR	1.000 km	85.000 IDR/100 km	130 g/km	Odd-even Regulation
10	800 million IDR	1.000 km	85.000 IDR/100 km	110 g/km	Tax Incentive
11	800 million IDR	900 km	65.000 IDR/100 km	110 g/km	Reserved Parking
12	500 million IDR	1.000 km	65.000 IDR/100 km	120 g/km	Reserved Parking
13	650 million IDR	1.000 km	75.000 IDR/100 km	130 g/km	Odd-even Regulation
14	650 million IDR	800 km	65.000 IDR/100 km	110 g/km	Odd-even Regulation
15	500 million IDR	800 km	75.000 IDR/100 km	110 g/km	Tax Incentive
16	800 million IDR	800 km	75.000 IDR/100 km	130 g/km	Odd-even Regulation
17	800 million IDR	1.000 km	65.000 IDR/100 km	120 g/km	Tax Incentive
18	500 million IDR	900 km	85.000 IDR/100 km	110 g/km	Reserved Parking
19	500 million IDR	1.000 km	65.000 IDR/100 km	110 g/km	Odd-even Regulation
20	800 million IDR	800 km	85.000 IDR/100 km	130 g/km	Reserved Parking
21	800 million IDR	1.000 km	65.000 IDR/100 km	120 g/km	Odd-even Regulation

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III. FINDINGS

Tables IV and V display the part-worth utilities value and the average preference importance score for HEV, respectively. Based on the average importance scores, the most influential attribute for customers was price, followed by policy, consumption, emissions, and driving range. Table IV displays the utility scores obtained by each attribute in order to calculate the utilities provided to each attribute level. First, respondents selected the cheaper price (500 million IDR) over the higher price (800 million IDR). Second, in terms of the driving range attribute of HEV, the greatest distance that may be driven was the most desired by respondents, followed by the shortest distance. In terms of the consumption attribute, respondents preferred the most fuel-efficient HEV. Fourth, in terms of the emission attribute of HEV, the lower the emission, the higher the utility value. The HEV policy attribute with the highest utility value was free odd-even regional road regulation, tied with government tax incentive, followed by reserved parking spot, which was the least desired.

Table IV. Part-worth utilities

Attribute	*Preferences*	*Utility Value*
Price	500 million IDR	0,578
	650 million IDR	0,085
	800 million IDR	-0,063
Driving Range	800 km	-0,154
	900 km	0,038
	1.000 km	0,116
Consumption	65.000 IDR/100 km	0,262
	75.000 IDR/100 km	-0,098
	85.000 IDR/100 km	-0,164
Emission	110 g/km	0,199
	120 g/km	0,098
	130 g/km	-0,297
Policy (Privilege)	Reserved parking spot	-0,457
	Odd-even regional road regulation	0,230
	Government tax incentive	0,227

Table V. Averaged importance score

Attribute	*Utility Score*	*%*
Price	39,758	39,7%
Driving Range	8,660	8,7%
Consumption	13,667	13,7%
Emission	15,914	15,9%
Policy (Privilege)	22,001	22%

In Table VI the 21 stimuli are ranked. With a total utility score of 1,386, the combination no.19 with the attributes of a price of 500 million IDR, a driving range of 1,000 km, consumption of 65,000 IDR/100 km, emissions of 110 g/km, and the free odd-even regional road regulation was revealed to be the respondents' preference out of the 21 stimuli evaluated. In contrast, respondents regarded combination no. 20 with a total utility score of -1,736, which combines HEV attributes with a price of 800 million IDR, a driving range of 800 km, consumption of 85,000 IDR/100 km, emissions of 130g/km, and a reserved parking policy, to be the least desirable.

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Table VI. Rankings

Combination	*Price*	*Range*	*Consumption*	*Emission*	*Privilege*	*Total Utility*	*Rank*
1	500 million IDR	800 km	65.000 IDR/100 km	110 g/km	Reserved Parking	0,429	6
2	650 million IDR	900 km	75.000 IDR/100 km	120 g/km	Odd-even Reg.	0,352	7
3	800 million IDR	1.000 km	85.000 IDR/100 km	130 g/km	Tax Incentive	-0,781	19
4	650 million IDR	800 km	85.000 IDR/100 km	120 g/km	Reserved Parking	-0,593	17
5	800 million IDR	900 km	75.000 IDR/100 km	120 g/km	Odd-even Reg.	-0.396	16
6	650 million IDR	1.000 km	75.000 IDR/100 km	110 g/km	Reserved Parking	-0,152	14
7	650 million IDR	900 km	65.000 IDR/100 km	130 g/km	Tax Incentive	0,315	9
8	650 million IDR	900 km	75.000 IDR/100 km	120 g/km	Tax Incentive	0,349	8
9	500 million IDR	1.000 km	85.000 IDR/100 km	130 g/km	Odd-even Reg.	0,462	5
10	800 million IDR	1.000 km	85.000 IDR/100 km	110 g/km	Tax Incentive	-0,284	15
11	800 million IDR	900 km	65.000 IDR/100 km	110 g/km	Reserved Parking	-0,621	18
12	500 million IDR	1.000 km	65.000 IDR/100 km	120 g/km	Reserved Parking	0,597	4
13	650 million IDR	1.000 km	75.000 IDR/100 km	130 g/km	Odd-even Reg.	0,037	13
14	650 million IDR	800 km	65.000 IDR/100 km	110 g/km	Odd-even Reg.	0,623	3
15	500 million IDR	800 km	75.000 IDR/100 km	110 g/km	Tax Incentive	0,753	2
16	800 million IDR	800 km	75.000 IDR/100 km	130 g/km	Odd-even Reg.	-0,985	20
17	800 million IDR	1.000 km	65.000 IDR/100 km	120 g/km	Tax Incentive	0,039	12
18	500 million IDR	900 km	85.000 IDR/100 km	110 g/km	Reserved Parking	0,194	10
19	500 million IDR	1.000 km	65.000 IDR/100 km	110 g/km	Odd-even Reg.	1,386	1
20	800 million IDR	800 km	85.000 IDR/100 km	130 g/km	Reserved Parking	-1,736	21
21	800 million IDR	1.000 km	65.000 IDR/100 km	120 g/km	Odd-even Reg.	0,042	11

Table VII. Correlation

	Value	*Significance*
Pearson's	0,855	0,000
Kendall's Tau	0,822	0,000

The correlation of the stimulus generated for this study is shown in Table VII. The Pearson's R value is 0.855, and the Kendall's Tau value is 0.822. As the obtained values are near to 1, the observed and estimated preferences are strongly correlated [28].

IV. DISCUSSION

With a total utility score of 1.386, the conjoint analysis revealed that among the various stimuli, HEV customers preferred pricing of 500 million IDR, driving range of 1,000 km, consumption of 65,000 IDR/100km, emission of 110 g/km, and policy of freedom of odd-even regional road regulation. The stimulus with the lowest utility score was the price of 800 million IDR, the driving range of 800 km, the fuel consumption of 85.000 IDR/100km, the emission of 130 g/km, and the privilege of a reserved parking spot, with a total score of -1,736.

215 legitimate respondents participated in the survey. The participation of men and women was about equivalent. The majority of participants were between the ages of 26 and 35 and were married. Most participants reside in Jakarta and Bandung. The average income of the participants is between 10 and 20 million Indonesian Rupiah (IDR) per month, and they work mostly as private employees. Using the Choice-based Conjoint analysis method, the survey results revealed that price influenced respondents' preferences the most, followed by policy, emission, consumption, and driving Range, in that order. The study reveals that customers are still hesitant to adopt HEV. This could be due to customers' impressions of these vehicles' limitations and their higher price compared to Internal Combustion Engine (ICEs) cars [29]. On the basis of customer preferences for this study, it is verified that price is the most influential attribute of HEV.

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With a score of 39,7%, price is the attribute that respondents consider the most influential. This statement is supported by the findings of Imran Ali and Mohammad, who concluded that pricing has a significant impact on the adoption of electric vehicles across all 366 respondents in India [15]. Under the pricing attributes, 500 million IDR was the most preferred while 800 million IDR was the least preferred. The 500 million IDR price level attribute was dominated by respondents who were male, married, between the ages of 26 and 35, employed by a private business, and earned between 10 and 20 million IDR each month.

Under the existing conditions, policies played a role in increasing respondents' acceptance of HEV, since they were the second most influential attribute in the survey (22% influence). Odd-even regulation, which is currently only applied in Jakarta, the capital city of Indonesia, and tax incentives from the government were among the respondents' top choices. On the other hand, policy 1, namely reserved parking spot, which is the author-selected attribute based on the literature review [26], has a negative impact on customer preferences.

Emission also played a moderate role in respondents' opinions, as it placed 3rd (15,9% influence) out of 5 attributes. This indicates that just a minority of respondents prefer this attribute, while others may believe that it does not influence their decision to purchase HEV. However, both the car companies and the government must still consider these attributes, after all the main goal to promote EV is to minimize the emission level [3-4 & 6-7]. Consumption and driving range were ranked 4th (13,7% influence) and 5th (8,7% influence) among attributes, providing a minor impact in HEV. Due to the fact that the majority of respondents (private workers) reside in major Indonesian cities such as Jakarta and Bandung, they did not require long-distance-capable vehicles on a daily basis, and the budget for fuel was adequate based on the survey's attributes.

A. Contributions

Based on the findings of this study, customers would prefer a hybrid electric vehicle (HEV) that is both cost-effective and supported by favourable policies. This study's findings can aid in the development of a strategic marketing plan in the increasingly competitive electric vehicle market, particularly the HEV sector. Businesses in the electric vehicle market should prioritize the preferences and choices of their customers. Additionally, offering a selection of HEVs will assist a business attract more customers. For the HEV market as a whole, marketers should demonstrate to customers how their products differ from those of competitors. Since customers place importance on the price and policy of a HEV, marketers can emphasize the vehicles' benefits, affordability, and distinctive policies.

B. Practical Applications

This study indicated that price and policy levels were the two most influential attributes influencing hybrid electric vehicle (HEV) customer preferences. Additionally, the study indicates that customers are still reluctant to adopt HEVs. This may be related to customers' perceptions of these vehicles' limitations and their higher price compared to vehicles with Internal Combustion Engines (ICEs). Policies played a considerable impact in boosting respondents' acceptance of HEVs under the existing conditions since they were the second most influential factor in the study. Odd-even regulation, which is currently only applied in Jakarta, the capital city of Indonesia, and tax incentives from the government were among the top responses; therefore, any policy involving special tax or others that aims to promote the circulation of HEVs will be effective in the short and long-term. Considering these findings, the researchers recommend that hybrid electric vehicle manufacturers integrate these attributes into product development and innovation to improve customer satisfaction with hybrid electric vehicles.

C. Limitations and Future Research

The initial data collection and preference measurement was conducted using an online survey. This resulted in a limited distribution of respondents, with a focus on those aged 18 to 35, who, according to Vogels, are the most active online [30]. In addition, the researchers exclusively considered the automobile preferences of Indonesian customers. Future research should collect more data from other nations, particularly those in which the number of hybrid electric vehicles is steadily increasing. This would aid in comparing the general public's preference for hybrid electric vehicles.

The hybrid electric vehicle attributes analysed in this study were based solely on the author's chosen literature review and practitioners. In the future, it would be interesting to explore various attributes, such as designs, batteries, infrastructure, services,

and performance levels, among many others. Therefore, future research could expand upon the findings about the preference for hybrid electric vehicles.

V. CONCLUSION

Since 2009, Hybrid Electric Vehicles (HEV) have been marketed on the Indonesian market as an eco-friendly electric car with lower emissions and improved fuel efficiency. HEV automatically identify and combine the optimal power source. In anticipation of the limited infrastructure for charging electric vehicle batteries, this mode uses a fuel-efficient conventional engine and an emission-free electric motor. This study utilized the Conjoint Analysis approach in conjunction with a choice-based survey design to determine the customer's preferred combination of HEV attributes. There was a total of 215 respondents who willingly engaged in the 21-combination online conjoint survey. Various attributes, including price, driving range, consumption, emissions, and policy, were reviewed.

The Conjoint Analysis revealed that price is the attribute that influences customer preferences the most. This was followed by policy, emissions, consumption, and driving range, which customers deemed to be the least important attribute. The outcomes of this study will be valuable for academics and perhaps electric vehicle manufacturers in terms of consumer preferences for various HEV attributes. Furthermore, this study can be expanded to include various types of electric vehicles in other nations.

AUTHORS' ACCORD

All authors have read and approved the version of the paper that has been published.

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INFORMED CONSENT STATEMENT

All participants in the study gave their consent after being fully informed.

DATA AVAILABILITY STATEMENT

The data described in this study are accessible from the author upon request.

CONFLICTS OF INTEREST

There are no conflicts of interest declared by the authors.

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