

Original Article

Predicting Consumer Preferences for Electric Vehicles in Indonesia Using Analytical Hierarchy Process (Case Study Hyundai Motor Indonesia)

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Abstract: Indonesia, the country with the fourth highest population globally, encounters distinct obstacles as it strives to achieve sustainable transportation solutions. Hyundai Motor Indonesia holds a significant portion of the market share for electric vehicles in Indonesia. This research aims to conduct a predictive analysis of electric vehicle purchase intentions in Indonesia. In this study, the method used was the concurrent mixed method, which integrates qualitative and quantitative data directly. The interviews conducted for this study captured detailed insights into the important aspects that potential customers consider while choosing their electric vehicle. AHP analysis for this research was done after gathering the interview data. The interviews had shown that for the interviewees, the criteria for buying electric cars include quality, pricing, battery guarantee, mileage, after-sales service, and design. The AHP analytical procedure presented Hyundai as fourth in the ranking of consumer purchase decisions. To this, Hyundai has devised a strategy for increasing sales growth by focusing on three major areas. They keep diversifying their product portfolio by introducing state-of-the-art technological advancements and adding features that match the market's demand. Second, Hyundai puts much emphasis on brand awareness through long-period publicity campaigns to strengthen the customers' perception of the brand. Lastly, Hyundai is planning to conduct product pricing by enhancing cost efficiency in production and providing more reasonable rates in conglomeration with the demands of consumers, who want electric vehicles to be cheaper.

Keywords: Hyundai, Electric Cars, AHP, Customer Preferences, Mix Methods.

I. INTRODUCTION

The global issue of climate change holds immense importance worldwide due to its profound and deleterious effects on the ecosystem. The main factor behind global warming is the emission of greenhouse gases, mostly caused by human activities such as air pollution and improper waste disposal practices, including indiscriminate littering and cremation. Wildan and Sodiq (Septaria et al., 2019) assert that global warming is an inherent occurrence that continues to be a prominent subject of discourse worldwide. According to Wardhana (Lestari et al., 2021), the emissions described earlier have the capacity to increase the temperature of the Earth's surface. This phenomenon is strongly associated with almost 75% of air pollution, which originates from exhaust emissions produced by fossil fuels in the transportation sector. Addressing pollution is undeniably a critical issue of concern in Indonesia. This is especially noteworthy, considering that Indonesia is recognized as one of the Southeast Asian countries with the most elevated levels of pollution (Merdeka, 2019). Electric vehicles have the capacity to function as a practical solution for reducing pollution, as they do not produce any emissions that contribute to environmental degradation. Although electric vehicles provide various advantages to consumers, including silent operation, lower charging costs compared to traditional refueling, reduced maintenance expenses, and significantly enhanced safety while driving, a considerable number of individuals still hesitate to switch to this mode of transportation (Gridoto, 2018).

Based on the Gaikindo data released by Databoks in 2023, the wholesale sales volume of electric vehicles (EV) in Indonesia reached 1,329 units in August 2023. This figure has increased by 24% compared to July 2023, and it is 30% higher than August of the previous year. Hyundai experienced positive sales of electric vehicles between January and October 2023. Hyundai electric cars constituted approximately 20.59% of the total sales, amounting to 6,084 units out of the overall figure of 29,537 units. Hyundai's retail car sales in October declined to 2,815 units, down from the previous month's total of 3,103 units, and the decline is ongoing.

On the other hand, Hyundai's main competitors, including Wuling, are currently witnessing an increase in sales. Another challenge to be addressed is the increase in the number of Chinese players who can offer much more competitive prices. The availability of cheaper options from Chinese players may lower the comparative attractiveness of Hyundai's product offering. This research will investigate variables affecting a person's decision-making process when choosing to purchase an electric



vehicle. In cases when there are several criteria to be taken into consideration for optimization, the MCDM method is applied to identify an optimal decision. According to Soeparyanto (2023), the Decision Making (MCDM) analytical process involves employing the Multi-Criteria approach, whereas the Analytical Hierarchy Process (AHP) method is utilized to identify hierarchical patterns and determine factor dominance. Furthermore, as stated by Syarif (2020), AHP allows for the consideration of many subjective assessments and improvements through checks on assessment consistency.

II. LITERATURE REVIEW

A) *Theoretical Framework*

a. **Electric Vehicle (EV)**

An electric car is a vehicle that uses an electric motor to move and relies on main energy sources such as chemical batteries, ultracapacitors, and flywheels. Electric cars (EVs) have numerous benefits compared to internal combustion engine vehicles (ICEVs). These features encompass quietness, enhanced energy conversion efficiency, reduced fuel usage leading to lower exhaust emissions, and centralized gas emissions for improved control. In the future, electric vehicles may be powered by renewable energy sources supplied by power plants, according to Kumara and Sukerayasa 2009. The operating principles and basic principles of EVs and ICEs are almost no different. However, there are significant differences between ICE and EV regarding the use of a gas tank/battery, the respective use of an ICE/electric motor, and independent transmission requirements.

b. **Purchase Decision**

The purchase decision-making process entails a series of steps. The first one is problem recognition. This is then followed by information gathering on a product or brand, which is then followed by the last step in this stage: alternatives evaluation, whereby the customer will evaluate each of the available alternatives based on their ability to solve the problem identified (Tjiptono, 2014). According to Kotler, 2008, the actual purchase or buying is the critical stage in the buyer's decision process since it is here that the customer actually takes an active approach to acquire the desired object. This process incorporates a problem-identifying consumer who engages in information-searching behavior about some product or brand and evaluates the effectiveness of each available alternative in solving the problem. This process then culminates when the consumer makes a final choice of buying.

The process of buying decision-making involves the selection of a product by a consumer that meets his/her own needs, wants, and expectations. Product selection can induce feelings of satisfaction or dissatisfaction driven by influences such as family influences, budgetary considerations, past experiences, and perceived product quality evaluations.

c. **Analytical Hierarchy Process (AHP)**

Dr. Thomas L. Saaty, a scholar associated with the Wharton School of Business, established the Analytic Hierarchy Process (AHP) in 1970. Analytical Hierarchy Process - One of the most widely used decision analysis techniques that involves assessing alternatives with respect to their scores so as to obtain the best alternative. According to Supranto, 2013, "every decision problem always faces multiple alternatives or options which must be evaluated against a number of different criteria which must be met or considered. Herjanto, 2006 stated that AHP is a decision-making methodology designed for solving specific problems that involve multiple hierarchies. The above-mentioned approach provides a practical means of dealing with complex problems by specially structuring the problem in a hierarchical framework, performing pairwise comparisons, and determining weighting factors, followed by evaluating such weighting factors in order to establish the relative priority among the available alternatives.

AHP is a decision-making process using many variables in a hierarchical analysis framework. In this study, each variable was given a priority value, and then the variables and alternatives were compared two by two (Saaty, 1993). Suryadi and Ramadhani (2000) said that AHP presented a comprehensive framework for decision-making. The Analytical Hierarchy Process is the process employed to solve problems that involve a great deal of objectives and criteria by evaluating the preferences of individual elements in a hierarchical framework.

B) *Research Methods*

This was a descriptive study that was supposed to ascertain the dimensions of the factors applied in acquiring electric cars. This study adopted a mixed research methodology, that is, a synthesis of both quantitative and qualitative methodologies. The mixed techniques used in developing this study were due to the presence of two separate types of data acquired from the research, including quantitative data and qualitative data (Sugiyono, 2012). The research methodology to be employed in this study is the concurrent mixed-method approach. Concurrent mixed methods refer to a type of research methodology that includes the integration of both qualitative and quantitative data simultaneously (Creswell, 2013). In this research approach, data collection regarding both the qualitative and quantitative aspects is collected separately before the

integration of the two for an in-depth study on the research topic. Being qualitative in nature, at the early stage of this study, data collection was done through several approaches, including interviews, observation, and analysis of the documents. The study started by conducting interviews among a group of electric vehicle buyers with considerable experience. The interviews conducted in this study provided a multifaceted understanding of the main and pivotal factors that consumers consider when choosing their autos. Based on the data collected from interviews, the current research implemented the Multi-Criteria Decision Making analysis methodology. This approach is utilized for categorizing and prioritizing the many factors identified through interviews, with a distinction in their various levels of importance and their actual impact on the electric vehicle purchasing process. The research currently undertaken is based on interviews to understand client preferences; it also goes ahead and makes use of MCDM and AHP analysis to make more comprehensive projections about the selection criteria for electric vehicles.

III. RESULTS AND DISCUSSION

A) Data Analysis

The sources are eight in number and were interviewed to determine what qualities the buyers want when selecting an electric vehicle. The sources have been selected from different walks of life in professional ways in order to get a wider range of information. Furthermore, these sources own or have purchased electric vehicles, thus verifying the criteria listed by the sources. The interviewees' purchasing criteria for electric cars are as follows:

1. **Quality**
The quality of an electric car includes the selection of materials, the longevity of the components, and the overall efficiency of the vehicle. Optimal quality guarantees an extended lifespan for the vehicle and delivers a pleasant and secure driving encounter for its customers.
2. **Price**
Consumers place significant importance on the cost of an electric vehicle. This encompasses the primary expenditure, ongoing expenses, and possible cost reductions in comparison to cars powered by fossil fuels. Consumers typically want a harmonious equilibrium between the price and the features provided.
3. **Warranty for the battery**
A battery guarantee is a contractual assurance provided by the manufacturer that guarantees the performance and longevity of an electric car battery for a specified duration. An extended and more inclusive warranty has the potential to enhance consumer trust in the dependability of the vehicle.
4. **Fuel efficiency**
The range per battery charge is a crucial consideration for buyers. An electric car's flexibility increases with higher travel distance, making it particularly suitable for long-distance trips without the need for regular recharging.
5. **After Sales Service**
After-sales service encompasses the provision of maintenance services, repairs, and dependable technical support. Effective service guarantees that consumers experience a sense of security and ease over an extended period of time following their purchase.
6. **Design**
Electric car designs and models encompass factors such as visual appeal, interior convenience, and the array of contemporary features available. An aesthetically pleasing and practical design has the potential to enhance a vehicle's desirability among consumers who prioritize lifestyle and prestige factors.

The AHP (Analytical Hierarchy Process) is a technique employed to facilitate decision-making involving several criteria. It involves the integration of preferences and weights from different criteria. This approach entails the subsequent procedures:

1. **Identify Criteria**
Initially, it is vital to ascertain the pertinent criteria for the process of decision-making. The selection criteria for electric cars are determined by elements that are pertinent to decision-making. Consumers make purchasing selections based on the priority criteria they have established.

Table 1: Criteria Selection

No	Criteria	Description
1	Quality	High-quality electric cars ensure durability, comfort, and safety for users.
2	Price	High-quality electric cars ensure durability, comfort, and safety for users.
3	Battery Warranty	A long and comprehensive battery warranty enhances consumer confidence in the reliability and longevity of the electric vehicle.
4	Range	A large driving range per battery charge provides greater flexibility for users, especially for long-distance

No	Criteria	Description
		travel.
5	After-Sales Service	Excellent after-sales service, including reliable maintenance and repair services.
6	Design	An attractive and functional design enhances the appeal of the electric vehicle, focusing on aesthetics, comfort, and modern features.

2. Creating a Hierarchy

After obtaining the criteria on the AHP, the next step is to compare the criteria with the importance scale, and the results can be seen in the table below.

Table 2: Criteria Comparison Matrix

No	Criteria	Quality	Price	Battery Warranty	Range	After-Sales Service	Design
1	Quality	1	0.5	0.25	0.333	0.2	0.333
2	Price	2	1	0.25	0.333	0.25	0.25
3	Battery Warranty	4	4	1	0.333	0.5	0.25
4	Range	3	3	3	1	0.333	0.5
5	After-Sales Service	5	4	2	3	1	0.333
6	Design	3	4	4	2	3	1
7	Total	18	16.5	10.5	7	5.283	2.667

Table 3: Criteria Normalization Matrix

No	Criteria	Quality	Price	Battery Warranty	Range	After-Sales Service	Design
1	Quality	0,056	0,03	0,02	0,048	0,04	0,125
2	Price	0,111	0,061	0,02	0,048	0,05	0,094
3	Battery Warranty	0,222	0,242	0,1	0,05	0,09	0,094
4	Range	0,167	0,182	0,29	0,14	0,063	0,188
5	After-Sales Service	0,278	0,242	0,19	0,429	0,189	0,125
6	Design	0,167	0,242	0,38	0,286	0,568	0,375
7	Total	1	1	1	1	1	1

3. Calculate Priority and Eigenvalue

Priority and Eigenvalue calculations are carried out in this step.

Table 4: Priority and Eigen Value calculations

No	Criteria	Total	Priority	Eigen Value
1	Quality	0,32	0,053	0,960
2	Price	0,38	0,064	1,057
3	Battery Warranty	0,796	0,133	1,390
4	Range	1,028	0,171	1,199
5	After-Sales Service	1,45	0,242	1,280
6	Design	2,019	0,336	0,897
7	Total	6	1	6,786

4. Hierarchy Consistency

The CI, RI, and CR value is determined by examining all the criteria and referencing the matrix.

Table 5: Calculate the CI, RI, and CR values

No	Parameter	Value
1	CI	0,1572
2	RI	1,2400
3	CR	0,1000

5. Calculate Each Criteria's Value

Subsequently, the priority values obtained will be utilized to ascertain the ranking of AHP values by assigning weights to each criterion

Table 6: Criteria Priority Values

No	Criteria	Value
1	Quality	0,053
2	Price	0,064
3	Battery Warranty	0,133
4	Range	0,171
5	After-Sales Service	0,242

No	Criteria	Value
6	Design	0,336
7	Total	0,053

6. Selection of Electric Cars

After getting the weighting value for each criterion that will be used, the next step is to determine the data that will be included in the AHP calculation.

Table 7: Selection of Electric Cars

No	Brand	Criteria					
		Quality	Price	Battery Warranty	Range	After-Sales Service	Design
1	Jaguar	3	3	3	3	3	3
2	Lexus	5	1	1	3	2	3
3	Mini	5	1	3	3	3	3
4	Porsche	5	1	3	4	1	3
5	Toyota	3	1	4	4	3	2
6	Volvo	3	1	4	4	3	3
7	BMW	3	1	3	4	1	5
8	BYD	4	5	2	4	1	5
9	Hyundai	3	5	3	4	3	4
10	Citroen	4	5	3	3	2	3
11	DFSK	1	3	1	2	2	1
12	VinFast	3	2	3	4	3	2
13	MG	3	2	3	4	3	2
14	Neta	4	2	1	4	2	2
15	Wuling	3	1	2	2	3	5
16	Chery	4	3	3	5	1	2

7. Result of AHP

Based on the total AHP calculation value data, the next step is to sort the electric car brand data based on the highest total value as the first rank to the lowest total value as the last rank

Table 8: Final Results of AHP Algorithm Ranking

No	Electric Car Brand	Total Value	Ranking
1	BYD	0,267	1
2	BMW	0,241	2
3	Wuling	0,238	3
4	Hyundai	0,204	4
5	Chery	0,150	5
6	Volvo	0,149	6
7	Citroen	0,145	7
8	Mini	0,143	8
9	Porsche	0,140	9
10	Toyota	0,137	10
11	VinFast	0,132	11
12	MG	0,132	11
13	Jaguar	0,130	13
14	Lexus	0,127	14
15	Neta	0,122	15
16	DFSK	0,083	16

B) Discussion

This research aims to examine Hyundai's strategy for increasing sales and market share in Indonesia through the use of qualitative research methods. The table above displays the AHP calculation results for electric car brands, indicating that Hyundai is ranked 4th with a total value of 0.204. Hyundai had a cumulative score of 0.204, ranking it as the fourth best among the 16 electric car brands that were examined. This indicates that Hyundai exhibits a comparatively robust performance in the electric vehicle industry despite the presence of several other brands that surpass it. BYD is ranked first with a total score of 0.267. BMW and Wuling hold the second and third positions, with respective values of 0.241 and 0.238. This indicates that Hyundai holds a competitive stance, although it still falls below the leading three brands. Chery ranks below Hyundai with a total value of 0.150, while Volvo ranks below Chery with a total value of 0.149. This demonstrates that Hyundai possesses a distinct edge over numerous other prominent manufacturers in the electric vehicle sector.

Hyundai conducts various surveys and market research activities to have a deeper understanding of consumer preferences and needs. Furthermore, Hyundai utilizes data acquired from dealers and direct input from customers. Hyundai arranges forums and talks with dedicated Hyundai users to obtain firsthand input into the attributes they consider vital. Hyundai uses this knowledge to develop goods that precisely meet the market's wants. Hyundai conducts various surveys and market research activities to have a deeper understanding of consumer preferences and needs. Furthermore, Hyundai utilizes data acquired from dealerships and direct input from customers. Hyundai arranges forums and talks with dedicated Hyundai users to obtain firsthand feedback on the features they consider vital. Hyundai uses this knowledge to develop goods that precisely meet the market's wants. Hyundai is not only focusing on technological advancements and creating new products but also making efforts to improve the awareness and reputation of its brand. Hyundai agrees that the level of brand identification in Indonesia is adequate, but there is still room for improvement. Hyundai has noticed an increasing acknowledgement and trust from consumers towards Hyundai products, mostly because of the launch of innovative and environmentally friendly new models.

Hyundai is not only focusing on developing products and promoting its brand but also aggressively seeking ways to reduce costs in order to improve its competitiveness, especially against Chinese electric cars that are priced lower. Hyundai Motor Indonesia is facing challenges in an increasingly competitive business, as other electric car manufacturers offer more affordable pricing alternatives. To tackle this trend, Hyundai has implemented many steps to improve the cost-effectiveness of production. At first, they implemented state-of-the-art manufacturing technologies and automation in their factories. Hyundai successfully reduced labor expenses and enhanced product uniformity and quality by using a more sophisticated production technique. Furthermore, Hyundai is placing a high priority on enhancing the efficiency of its supply chain to get top-notch raw materials at more advantageous prices. Hyundai places high importance on labor issues by providing ongoing training to its employees. This training program ensures that the production team has current knowledge and is proficient in running the organization's modern technologies. Hyundai has implemented a more efficient production management system to reduce the time and costs involved in manufacturing each unit. The results of these efforts are apparent in their latest electric vehicle models, which are produced with lower costs and shorter production times.

IV. CONCLUSION

The objective of this study is to perform a predictive analysis of the intentions to buy electric vehicles in Indonesia, specifically focusing on Hyundai Motor Indonesia. Furthermore, this paper examines the business development techniques that Hyundai has implemented to address this issue. According to the findings of the conducted research, Hyundai is ranked fourth in terms of consumer purchase decisions, taking into account factors such as Quality, Price, Battery Warranty, Range, After-Sales Service, and Design. Although not at the top of the rankings, this position showcases Hyundai's success in building a solid market reputation by prioritizing product quality, competitive pricing, battery warranty, range, after-sales assistance, and attractive design. Hyundai executes its sales expansion strategy by employing three main approaches. Firstly, they continue to enhance their product range by bringing state-of-the-art technological improvements and including features that are in accordance with market desires. In addition, Hyundai prioritizes enhancing brand awareness through extensive and long-lasting marketing strategies, aiming to strengthen the way consumers perceive the brand. In addition, Hyundai is placing a high priority on setting product prices by improving the efficiency of production costs and offering more competitive rates. This is in line with consumer demands for more affordable electric vehicles.

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