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Mapping Business Strategy of Electric Motorcycle Conversion Through Swot Analysis and Business Model Canvas

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Abstract

Converted electric motorcycles are the outcome of transforming motorcycles that run on fossil fuels into electric ones. This conversion aims to promote the growing adoption of electric vehicles, prolong the lifespan of motor vehicle products, and mitigate carbon emissions in the transportation sector. Hence, the objective of this study is to ascertain and evaluate the market position of the converted electric motorcycle industry by utilizing Strengths, Weaknesses, Opportunities, Threats (SWOT), and Business Model Canvas (BMC) analysis. Primary data collection involved conducting interviews and utilizing brainstorming approaches with professionals from electric vehicle manufacturers and academia. Nine business strategy models for converted electric motorcycles were derived from the investigation using the BMC technique. According to the examination of the Internal Factor examination Summary (IFAS) and External Factor Analysis Summary (EFAS) matrices, a growth strategy has been selected. This approach indicates that the business possesses strengths and opportunities. Therefore, it requires policies that promote rapid expansion through comprehensive, integrated, and diversified methods. Recommendations for further research include exploring company strategies that use a circular and sustainable approach.

.***Keywords:*** *Business Model Canvas,* EFAS, IFAS, *Electric Motorcycles Conversion, SWOT*

I. INTRODUCTION

Net zero emission is a condition where the amount of carbon emissions released into the atmosphere does not exceed the amount that the Earth can absorb [1]. Indonesia has committed to achieving net zero emissions by 2060 [2]. A transition to a clean energy system is required to realize this commitment.

The transportation sector is one of the contributors to greenhouse gas emissions, amounting to 24.64% of other sectors [3]. The use of electric vehicles is a solution to reduce the use of fossil fuels. The largest consumption of fossil fuels in the transportation sector in 2019 was 415 million BOE (barrels of oil equivalent), or around 99.97%. This condition will continue to increase yearly, which is in line with the increase in the number of vehicles, with an average growth of 8.32% per year [3].

Motorcycles dominate the transportation sector in Indonesia at 41% in 2018 [4]. This is because motorcycles are the mainstay vehicles for Indonesians because of their cheap purchase price and faster travel time. Converting fossil-fueled motorcycles to electric motorcycles is one way to increase the use of electric vehicles [5], [6].

Regulations regarding the conversion of motorcycles with combustion engine drives into battery-based electric motorcycles have been issued through the Regulation of the Minister of Transportation of the Republic of Indonesia Number PM 65 of 2020 [7]. Besides, converting electric vehicles is a solution to extend the life of fossil fuel-based motorcycle products and reduce carbon gas emissions [8]. Several previous studies related to business strategies with electric vehicles as the research object can be seen in Table 1.

Several previous studies with research topics on business strategy, including using the BMC, SWOT, AHP, TOPSIS, QSPM, Delphi, and MARCOS methods, can be seen in Table 2. The Analytical Hierarchy Process (AHP) method was developed as a mathematical method for analyzing decision problems from several criteria [15]. The TOPSIS method is very useful for solving real problems and providing the best optimal solution for determining the ranking of several alternatives [16]. Furthermore, another method for determining the best strategy is the Quantitative Strategic Planning Matrix (QSPM) method, which produces a QSPM matrix and a Total Attractive Score (TAS) value [17].

Meanwhile, the Delphi method is a qualitative decision-making method that involves several experts [18]. Measurement Alternatives and Ranking according to Compromise Solution (MARCOS) is a method used in the Multi Criteria Decision Making (MCDM) decision support system. The method defines the relationship between alternatives and reference values that produce preference values based on each method used [19].

Table 1. Previous studies related to business strategies

Reference	Research Object	Research Method	Study Results
[9]	Business innovation for electric vehicle promotion in Shenzhen, China	Business Model Canvas (BMC)	Suggested further improvements in charging infrastructure through public-private partnerships and standardization of electric vehicle technology.
[10]	Sustainable business model for used electric vehicle batteries	Business Model Framework	Proposed B2U (Business-to-Utility) business model framework focused on multi-sector cross-sector impacts.
[11]	Business strategy for electric vehicle battery swap	BMC	The business model that has been formed will be the basis for designing a business plan consisting of a management profile and financial analysis.
[12]	Designing a business model for electric vehicles in the Netherlands	Business Model Design Space	The space framework design of a business model consisting of market, culture, industry, policy, science, and technology dimensions.
[13]	The role of product design in the circular business model of electric vehicles	Business Model Innovation Framework	
[14]	Competitive strategies of electric car companies	Porter's Analysis	Consistency is needed by electric car manufacturers who must create long-term marketing plans to take over conventional cars' market share.
Proposed Research	Business strategy for electric motorcycle conversion	BMC and SWOT	-

Table 2. State of the art (SOTA)

Reference	BMC	SWOT	AHP	TOPSIS	QSPM	Delphi	MARCOS
[15]		√	√				
[20]		√		√			
[17]		√			√		
[21]							
[22]		√					
[18]		√	√			√	
[19]		√	√				√
[23]	√						
[13]		√					
Proposed research	√	√					

The BMC method focuses on the variable of developing a new business model, that is, the electric motorcycle conversion business. Whereas, the SWOT method focuses on the electric motorcycle conversion business's strengths, weaknesses, opportunities, and threats. This study aims to analyze the business strategy of electric motorcycle conversion using the BMC and SWOT methods. Therefore, research related to the electric motorcycle conversion's business position is necessary to support government policies and increase the electrification trend in the transportation sector.

II. LITERATURE REVIEW

SWOT analysis is a planning tool to assess and determine whether a condition is categorized as a strength, weakness, opportunity, or threat. A planning process requires assessing the current conditions and future outlook that affect the achievement of a goal [24], [25].

A business model canvas is a model that describes, visualizes, and assesses a business model to produce alternative new business strategies. BMC design is conducted by filling in nine variables containing customer segments, value proposition, customer relationship, channel, revenue stream, key resource, key activities, key partnership, and cost structure [11], [26], [27].

III. METHODS

The type of research is descriptive qualitative, which aims to analyze data by describing qualitative data. Qualitative data is data that is not expressed in the form of numbers [8]. Primary data sources were obtained through direct interviews with the production manager of an electric motorcycle company in Indonesia.

In the study, the electric motorcycle conversion product is an example of a new business model because it is not yet known to the public, and the number of conversion workshops available is limited. The business model canvas was used to develop a new business model or document an existing business model [27]. The SWOT analysis was performed to determine the strengths, weaknesses, threats, and opportunities of the electric motorcycle conversion product. It will provide alternative strategies that will later be considered in preparing to develop the electric motorcycle conversion model explained in the BMC.

Research methodological steps carried out in the study were:

A. Designing the Business Model Canvas

A BMC design of electric motorcycle conversion was made based on interviews with electric motorcycle manufacturers and academics who have conducted research on electric motorcycle conversion. Data was collected by mapping nine BMC elements [28] on the proposed electric motorcycle conversion business model, as listed in Table 3.

B. Performing SWOT Analysis

The SWOT analysis matrix focuses on four combination strategies, namely strengths-opportunities (SO), weakness-opportunities (WO), strengths-threats (ST), and weakness-threats (WT) [29]. Determination of internal and external factors in the SWOT analysis is performed through interviews. In addition, the weight and rating of these factors are determined through brainstorming by stakeholders, practitioners of electric vehicle manufacturers, and academics.

IV. RESULTS AND DISCUSSIONS

A. Designing Business Model Canvas

The business strategy for converted motorcycle products using the business model canvas method is as follows:

1) Customer Segment

Market segments can be grouped based on geographic location, demographics, psychographics, and consumer behavior [11]. The transportation sector in Indonesia was dominated by motorcycles at 41% in 2018 [4]. This is because motorcycles are cheaper, faster, and the mainstay in big cities. Thus, the market segment for electric vehicle conversion is people who have fossil-fueled motorcycles—especially people who have motorcycles that are over five years old. The purpose of converting the motorcycle is to reduce carbon emissions and fossil fuel use.

2) Value Propositions

The value given to consumers for electric motorcycle conversion products is still in development, so the availability of conversion workshop facilities must be easy to find. In addition, information and services must be clear, fast, and accessible for consumers who want to change their fossil fuel motorcycles. The cost aspect is the most important value that consumers of electric motorcycle conversions will consider. Consumers also need aftersales service, warranty, and warranty conditions.

Table 3. Question variables for the business model canvas

Variable	Questions
Value Propositions	What value will be built for customers?
Revenue Streams	What are the income sources?
Cost Structure	a. What are the costs included? b. What is the most expensive resource in this business?
Key Resource	a. What is the main resource? b. What infrastructure does a converted electric motorcycle have?
Key Activities & Key Partnerships	What activities does a converted electric motorcycle perform?
Customer Segment	Who are the customers for electric motorcycle conversions?
Channel	How is the service provided to customers of electric motorcycle conversions?
Customer Relationships	a. How to build relationships between customers? b. How to build relationships with customers?

3) Channel

Several main factors include the availability of electric motorcycle conversion services to consumers, such as conversion workshops, spare parts, battery charging, and swap battery replacement services as a substitute energy source for fossil fuels.

4) Customer Relationships

In order to create a good relationship with customers, business owners of electric motorcycle conversion services must be able to provide consumer services, brand image, good company reputation, discounts, and warranties.

5) Revenue Streams

The revenue stream in the electric motorcycle conversion product business focuses on the revenue of the automotive segment, the power generation segment, and the conversion workshop. Pricing can refer to market surveys, such as based on prices of electric motorcycle conversion components and conversion service fees.

6) Key Activities

The core activities of the electric motorcycle conversion business include the procurement availability of components, conversion services carried out at conversion workshops, and promotions to increase consumer interest in converting their fossil-fueled vehicles.

7) Key Resource

The core resources of the electric motorcycle conversion business are human resources, such as certified mechanics and electricians. They carry out electric motorcycle conversions on components such as BLDC motors, battery systems, and wiring systems at conversion workshops.

8) Key Partnerships

Partnerships are stakeholders in the electric motorcycle conversion business, including the government, investors, suppliers of electric vehicle components, and online motorcycle taxi transportation companies.

9) Cost Structure

The electric motorcycle conversion business's cost components consist of fixed and variable costs. Fixed costs remain constant and are not affected by changes in the volume of activity. Variable costs are costs whose total amount changes proportionally with changes in the volume of activity [30].

Based on the discussion of the nine business strategy models, the nine BMC elements can be described as a business strategy for electric conversion motorcycles, as seen in Table 4.

B. SWOT Analysis

The first step in analyzing SWOT was determining the strengths, weaknesses, opportunities, and threats of the conversion motorcycle business obtained from interviews with electric motorcycle manufacturers. The next step was to provide weights and ratings for each factor, which was done through brainstorming with stakeholders. Then, the Internal Factor Analysis Summary (IFAS) and External Factor Analysis Summary (EFAS) were compiled so that a strategy for the conversion of the motorcycle business could be determined, as shown in Table 5. It can be conducted by performing the following actions [25]:

a. Identify and determine strengths, weaknesses, opportunities, and threats as factors.
b. Give each factor a weight on a scale from 0.0 (not important) to 1.0 (very important).
c. The identified factors are given a rating on a scale ranging from 4 (highest) to 1 (lowest). The rating for opportunity factors is positive, while the rating for threat factors is otherwise.
d. Multiply the weight and rating to get a score value.
e. Calculate the total weighted score by adding the IFAS and EFAS weighted scores.

Table 4. Business model canvas of electric motorcycle conversion

BMC Elements	Business Model Canvas of Electric Motorcycle Conversion
Value Propositions	1. Conversion workshop facilities must be easy to find 2. Clear information and quick-and-easy services must be performed 3. The cost of converting an electric motorcycle is cheaper than having to buy a new fossil-fueled vehicle 4. Product guarantee or warranty must be provided to customers
Revenue Streams	1. Pricing is based on market surveys and customer capabilities 2. Revenue from the automotive segment, power generation segment, and conversion workshops is the main focus
Cost Structure	1. Fixed cost: Shop rental fees 2. Variable costs: raw material costs, direct labor costs
Key Resource	1. Human resources 2. Conversion workshops 3. Electric motorcycle conversion systems
Key Activities	1. Procurement availability of electric motorcycle conversion components 2. Promotion and product sales 3. Conversion services of fossil-fueled motorcycles into electric motorcycles
Key Partnerships	1. Government 2. Investor 3. Main suppliers 4. Transportation companies
Customer Segment	1. People who own fossil-fueled motorcycles that are more than five years old in usage 2. Sustainable and Green Community
Channel	1. Availability of conversion workshops 2. Availability of spare parts for electric motor conversion vehicles 3. Service center for battery charging and swap battery replacement
Customer Relationships	1. Consumer services 2. Brand 3. Reputation 4. Discounts 5. Guarantees

Table 5. Internal Factor Analysis Summary (IFAS)

Number	Internal Factors	Weight	Rating	Score
Strengths (S)				
1	Design, features, and dimensions are in accordance with electric motorcycles in general.	0.22	4	0.88
2	No regular vehicle servicing is required.	0.10	3	0.3
3	It functions as an alternative to extending the product life for fossil-fueled vehicles that are over five years old in usage.	0.20	4	0.8
	Sub Total	**0.52**		**1.98**
Weakness (W)				
1	The electric vehicle ecosystem, such as charging stations and battery swaps, is not yet available.	0.16	2	0.32
2	A limited number of conversion workshops	0.16	2	0.32
3	High cost of vehicle conversion fees	0.16	2	0.32
	Sub Total	**0.48**		**0.96**
	Total	**1**		**2.94**

EFAS strategies were structured in the same way and presented in Table 6.

Table 6. External Factor Analysis Summary (EFAS)

Number	External Factors	Weight	Rating	Score
Opportunities (O)				
1	Government support for the program to accelerate the conversion of fossil-fueled vehicles into electric vehicles	0.23	4	0.92
2	Society tends to reduce carbon gas emissions through the concept of a sustainable lifestyle.	0.24	4	0.96
3	Natural resources in Indonesia, such as nickel and cobalt, are abundant and used as raw materials for making electric vehicle batteries.	0.21	4	0.84
	Sub Total	**0.68**		**2.72**
Threats (T)				
1	Fossil-fueled vehicles are available at cheaper prices than the costs that must be incurred for vehicle conversion.	0.16	2	0.32
2	The high cost of purchasing electric vehicle batteries.	0.16	2	0.32
3	The emergence of electric motorcycle variants with new technology.	0.16	2	0.32
	Sub Total	**0.32**		**0.64**
	Total	**1**		**3.36**

Growth strategy is the most profitable business situation because it has strengths and opportunities, so it is necessary to support aggressive growth policies. Meanwhile, the turnaround strategy is a strategy to change direction by seizing large external opportunities, but internal weaknesses within the organization need to be solved. Through a diversification strategy, the company can identify strengths to reduce external threats. Finally, a defensive strategy is carried out by minimizing existing weaknesses to avoid threats [24].

Based on the calculation results of internal and external factors of the electric motorcycle business, the strength = 1.98, weakness = 0.96, opportunities = 2.72, and threats = 0.64. The selected strategy is listed in Table 7. According to the IFAS and EFAS analysis that has been carried out, the electric motorcycle conversion business is in a growth and build position. Strategies that electric motorcycle conversion business owners can apply include intensive, integrative, and diversification strategies [31].

Table 7. Recapitulation of IFAS and EFAS scores

Strategy Choices	Internal Scores	External Scores
Growth	S > W (+) 1.98 > 0.96 (+)	O > T (+) 2.72 > 0.64 (+)
Diversification	S > W (+)	O < T (-)
Turnaround	S < W (-)	O > T (+)
Defensive	S < W (-)	O < T (-)

Furthermore, the SWOT matrix design is vital to help owners of electric motorcycle conversion workshops develop four types of strategies, as seen in Table 8.

V. CONCLUSIONS

According to results based on the BMC analysis method, nine business strategic models of electric motorcycle conversion were obtained: value propositions, revenue streams, cost structures, key resources, key activities, key partnerships, customer segments, channels, and customer relationships. IFAS matrix-based calculations resulted in the electric motorcycle conversion as a business having a greater value of the strengths than weaknesses, while the EFAS matrix-based calculations revealed greater opportunities than threats. Then, according to the SWOT analysis, the chosen strategy is a growth strategy, which means that the business has strengths and opportunities, so policies are required for aggressive growth.

The business strategy model will be fundamental for designing a business plan for electric motorcycle conversion. The study proposed a business design for electric motorcycle conversion that can be done in the future. In order to escalate the development of the electric motorcycle business in Indonesia, further research on determining the location of strategic electric charging stations, creating a standardization framework, and establishing testing requirements for electric vehicle conversion is highly suggested. In addition, further research can take the form of developing strategic business planning that is circular and sustainable.

Table 8. Business Strategy for Electric Motorcycle Conversion

Strategy	Description	Type of Strategy
S-O Strategy	To improve the quality of motorcycle products converted from gasoline to electric. Product quality can be improved by adding futuristic features and designs.	Intensive Strategy
	To increase promotion with government support. Government support can be in the form of electric vehicle tax relief policies and incentives for workshops that provide electric vehicle conversion services.	Intensive Strategy
W-O Strategy	Improve the ecosystem for electric vehicles by involving state-owned and private companies so that many charging stations and conversion workshops are available.	Integration Strategy
	To increase investment opportunities in collaboration with foreign parties to build and develop efficient electric vehicle batteries.	Integration Strategy
	Supporting and campaigning for an environmentally friendly lifestyle (net zero emission) in the community.	Integration Strategy
S-T Strategy	Government support is needed to provide subsidies for people who convert fossil-fueled vehicles to electric vehicles.	Integration Strategy
	Conducting research development related to features, design, and safety of converted electric motorcycle vehicles.	Diversification Strategy
W-T Strategy	Improving cooperation between stakeholders in the supply chain network of electric motorcycle conversion, including the government, conversion workshops, related state-owned companies (PLN, Pertamina), automotive companies, testing workshops, and electric vehicle battery research institutions.	Integration Strategy
	The emergence of competitors from fossil-fueled vehicles and electric vehicle variants can be anticipated by adding attractive features and designs and providing a guarantee for the use of converted electric motorbikes.	Intensive Strategy

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