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RANKED KEY FACTOR THAT AFFECT PERSON DECISION TRANSFORMING TO AN ELECTRIC VEHICLE : STRUCTURAL EQUATION MODELLING

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ABSTRACT

The development of electric vehicles (EVs) has significantly disrupted the world's road transportation industry. EVs are predicted to account for more than 50% of new vehicle sales globally by 2035, however demand will differ greatly from country to country. Automobile is one of Indonesia's key industry that support GDP, it is important for the industry to adapt to the transformation from ICE (Internal Combustion Engine) to EV (Electric Vehicle). Using the SEM (Structural Equation Model) Analysis approach, this research will help the automobile industry in Indonesia by reviewing and analyzing the key factor of Electric Vehicles. From this analysis, the industry can learn and implement the right strategy to penetrate the potential EV demand of Indonesia market.

Keywords: Electric Vehicle, Strategy, Transformation, Automotive, Structural Equation Modelling.

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1. INTRODUCTION

1.1. Background

The improvement of electric vehicles (EVs) has essentially disturbed the world's street transportation industry. EVs are anticipated to account for more than 50% of used vehicle globally by 2035, in any case request will vary enormously from nation to nation. EVs are presently common in numerous districts of the world. In response to the slow adoption of electric vehicles in the nation, the Indonesian government has issued a number of regulations for the expansion of the automotive industry. The government has set 2025 adoption goals of 2,200 electric vehicles and 2.1 million electric motorcycles. In addition, as stated in the Presidential Regulation No. 22 of 2017 of the Republic of Indonesia about the National Energy General Plan, the government established a target for Indonesia to be able to produce 2,200 electric or hybrid cars.

As the automobile industry is one of the vital supports for Indonesian GDP, it is important to keep the sustainability of the automobile industry by knowing the key factor and executing the proper strategy to have a seamless transition to the future of automobile. Understanding key factor of electric vehicles may enable the industry to pinpoint the elements that influence a person's decision to pur-chase an EV.

There are four variable that being used in this research, which is: Social Demographic, Financial Factor, Technological Development, and Ecosys-tem. All of that variable is discovered through deductive study. Social Demo-graphic variable will cover age, gender, income, and current vehicle ownership. Financial Factor will cover on price of EV, the maintenance, Total Cost of Ownership, and subsidiary from government. Technological Development will cover on current state of battery range provided, battery cost, technical specification, and EV features. And lastly, the Ecosystem that will wrap about charging station avaibility, the portability of a charger, and service place for routine maintenance.

2. METHODS

2.1 Structural Equation Modelling

Structural Equation Modelling (SEM) is a method for research that analyses a collection of regression equations simultaneously. In other words, the purpose of SEM analysis is to analyses the relationship between 1 or more independent vari-ables and 1 or more dependent variables. Below shown is the factor and its hypothesis on the effect to the buying decision.

2.2 Questionnaire

To do the SEM Analysis, the researcher needs data from automotive observer on how is the current state of EV in Indonesia, how is the specification and gimmick feature, the price, and even their opinion on ecosystem and Total Cost of Owner-ship that EV faces. The form of the instrument used to collect data is in the form of a questionnaire.

To obtain questions related to this research problem, a list of several references that are relevant to the research problem and discussion is compiled. On this re-search, the questionnaire is shared to several automotive forums, combined from ICEV automobiles forum and EV automobile forums.

3. DATA COLLECTION AND PROCESSING

3.1. Hypothesis

According to the literature, this research will be built with these hypotheses, later on this hypothesis will be tested and analyzed using Structural Equation Modelling (SEM).

Table 1. Hypothesis

Demographic	H1	Age has a positive significant effect on the intention of buying an Electric Vehicle.
	H2	Gender has a positive significant effect on the intention of buying an Electric Vehicle.
	H3	Income has a positive significant effect on the intention of buying an Electric Vehicle.
	H4	Vehicle Ownership has a positive significant effect on the intention of buying an Electric Vehicle.
Financial	H5	EV Price has a positive significant effect on the intention of buying an Electric Vehicle.
	H6	EV Maintenance has a positive significant effect on the intention of buying an Electric Vehicle.
	H7	EV TCO has a positive significant effect on the intention of buying an Electric Vehicle.
	H8	EV Incentive/subsidiary has a positive significant effect on the intention of buying an Electric Vehicle.
Technological Development	H9	EV Range Capacity has a positive significant effect on the intention of buying an Electric Vehicle.
	H10	EV ADAS Feature has a positive significant effect on the intention of buying an Electric Vehicle.
	H11	EV Technical Specification has a positive significant effect on the intention of buying an Electric Vehicle.
Ecosystem	H12	EV Charging Station Spreadness has a positive significant effect on the intention of buying an Electric Vehicle.
	H13	EV Charging Portability has a positive significant effect on the intention of buying an Electric Vehicle.
	H14	EV Aftersales Guarantee has a positive significant effect on the intention of buying an Electric Vehicle.

3.2 Respondent Demographic

This chapter reports on the response rate for the survey and structured record review, presents descriptive statistics of the sample and the variables used in the study using SEM AMOS, and presents inferential statistics which address the research hypothesis. Total of 158 questionnaire result were retrieved, below is the demographic factor of the respondent.

Table 2. Respondent Demographic

Respondent Demographic		
Age	17 - 25	32%
	26 - 35	39%
	36 - 45	20%
	46 - 60	10%
Gender	Male	79%
	Woman	21%
Net Income	< Rp. 2.000.000	24%
	< Rp. 10.000.000	28%
	< Rp. 20.000.000	23%
	< Rp. 50.000.000	17%
	> Rp. 50.000.000	8%
Current Vehicle	ICEV / Conventional Combusti	70%
	EV / Electric Vehicle	11%
	Hybrid Vehicle	18%

3.3. SEM Indicator and Variable Result

Table 3. SEM Indicator and Variable Result

Indicator and Variable			Standard coefisien	t-value	p-value
D1	<---	Demographic	0.824	9.537	0.000
D2	<---	Demographic	0.535	6.273	0.000
D3	<---	Demographic	0.839	9.621	0.000
D4	<---	Demographic	0.742		0.000
F1	<---	Financial	0.776	10.563	0.000
F2	<---	Financial	0.848	11.832	0.000
F3	<---	Financial	0.897	12.668	0.000
F4	<---	Financial	0.791		0.000
T1	<---	Technological_Development	0.792	12.478	0.000
T2	<---	Technological_Development	0.853	14.167	0.000
T3	<---	Technological_Development	0.885		0.000
E1	<---	Ecosystem	0.834	12.825	0.000
E2	<---	Ecosystem	0.856	13.323	0.000
E3	<---	Ecosystem	0.856		0.000

a) Influence of age on buying intention

According to the table 10, It is discovered that D1 (Age) obtained a standard estimate coefficient of 0.824 with a probability value of 0.000 <0.05, it can be stated that D1 has a significant effect on buying intention. Thus Hypothesis H1 Age has a positive significant effect on the intention of buying an Electric Vehi-cle. Supported by data and ranked no. 9 for the correlation to the buying inten-tion.

b) Influence of gender on buying intention

According to the table 10, It is discovered that D2 (Gender) obtained a stand-ard estimate coefficient of 0.535 with a probability value of 0.000 <0.05, it can be stated that D2 has a significant effect on buying intention. Thus Hypothesis H2 Gender has a positive significant effect on the intention of buying an Electric Vehicle. Supported by data and ranked no. 14 for the correlation to the buying intention.

c) Influence of net income on buying intention

According to the table 10, It is discovered that variable D3 (Net Income) obtained a standard estimate coefficient of 0.839 with a probability value of 0.000 <0.05, it can be stated that D3 has a significant effect on buying intention. Thus Hypoth-esis H3 Net Income has a positive significant effect on the intention of buying an

Electric Vehicle. supported by data and ranked no. 7 for the correlation to the buying intention.

d) Influence of vehicle ownership on buying intention

According to the table 10, It is discovered that variable D4 (Vehicle Ownership) obtained a standard estimate coefficient of 0.742 with a probability value of 0.000 <0.05, it can be stated that D4 has a significant effect on buying intention. Thus Hypothesis H4 Vehicle Ownership has a positive significant effect on the intention of buying an Electric Vehicle. supported by data and ranked no. 13 for the correlation to the buying intention.

e) Influence of EV price on buying intention

According to the table 10, It is discovered that F1 (EV Price) variable obtained a standard estimate coefficient of 0.776 with a probability value of 0.000 <0.05, it can be stated that F1 has a significant effect on buying intention. Thus the H5 EV Price hypothesis has a positive significant effect on the intention of buying an Electric Vehicle. supported by data and ranked no. 12 for the correlation to the buying intention.

f) Influence of maintenance cost on buying intention

According to the table 1010, It is discovered that Variable F2 (Maintenance Cost) obtained a standard estimate coefficient of 0.848 with a probability value of 0.000 <0.05, it can be stated that F2 has a significant effect on buying intention. Thus Hypothesis H6 EV Maintenance has a positive significant effect on the in-tention of buying an Electric Vehicle. supported by data and ranked no. 6 for the correlation to the buying intention.

g) Influence of total cost of ownership on buying intention

According to the table 10, It is discovered that Variable F3 (Total Cost of Owner-ship) obtained a standard estimate coefficient of 0.897 with a probability value of 0.000 <0.05, it can be stated that F3 has a significant effect on buying inten-tion. Thus the H7 EV TCO hypothesis has a positive significant effect on the in-tention of buying an Electric Vehicle. It is supported by data and ranked no. 1 for the correlation to the buying intention.

h) Influence of incentive on buying intention

According to the table 10, It is discovered that Variable F4 (Incentive) obtained a standard estimate coefficient of 0.791 with a probability value of 0.000 <0.05, it can be stated that F4 has a significant effect on buying intention. Thus the H8 EV Incentive/subsidiary hypothesis has a positive significant effect on the intention of buying an Electric Vehicle. supported by data and ranked no. 11 for the corre-lation to the buying intention.

i) Influence of range capacity on buying intention

According to the table 10, It is discovered that Variable T1 (Range Capacity) obtained a standard estimate coefficient of 0.792 with a probability value of 0.000 <0.05, it can be stated that T1 has a significant effect on buying intention. Thus the hypothesis H9 EV Range Capacity has a positive significant effect on the intention of buying an Electric Vehicle. supported by data and ranked no. 10 for the correlation to the buying intention.

j) Influence of feature on buying intention

According to the table 10, It is discovered that Variable T2 (Feature) obtained a standard estimate coefficient of 0.853 with a probability value of 0.000 <0.05, it can be stated that T2 has a significant effect on buying intention. Thus the hy-pothesis H10 EV ADAS Feature has a positive significant effect on the intention of buying an Electric Vehicle. supported by data and ranked no. 5 for the correla-tion to the buying intention.

k) Influence of technical specification on buying intention

According to the table 10, It is discovered that Variable T3 (Technical Specifica-tion) obtained a standard estimate coefficient of 0.885 with a probability value of 0.000 <0.05, it can be stated that T3 has a significant effect on buying

intention. Thus Hypothesis H11 EV Technical Specification has a positive significant effect on the intention of buying an Electric Vehicle. supported by data and ranked no. 2 for the correlation to the buying intention.

l) Influence of charging station vaibility on buying intention

According to the table 10, It is discovered that Variable E1(Charging Station Avaibility) obtained a standard estimate coefficient of 0.834 with a probability value of 0.000 <0.05, it can be stated that E1 has a significant effect on buying intention. Thus the hypothesis H12 EV Charging Station Spreadness has a posi-tive significant effect on the intention of buying an Electric Vehicle. supported by data and ranked no.8 for the correlation to the buying intention.

m) Influence of portability of charger avaibility on buying intention

According to the table 10, It is discovered that Variable E2 (Portability of Charger) obtained a standard estimate coefficient of 0.856 with a probability value of 0.000 <0.05, it can be stated that E2 has a significant effect on buying intention. Thus Hypothesis H13 EV Charging Portability has a positive signifi-cant effect on the intention of buying an Electric Vehicle. supported by data and ranked no.3 for the correlation to the buying intention.

n) Influence of aftersales guarantee avaibility on buying intention

According to the table 10, It is discovered that Variable E3 (Aftersales Guaran-tee) obtained a standard estimate coefficient of 0.856 with a probability value of 0.000 <0.05, it can be stated that E3 has a significant effect on buying intention. Thus Hypothesis H14 EV Aftersales Guarantee has a positive significant effect on the intention of buying an Electric Vehicle. supported by data and ranked no.4 for the correlation to the buying intention.

4.RESULT AND CONCLUSION

This study demonstrates the importance of factors in Indonesia's adoption of Electric Vehicles. In the regression analysis using SEM, the Total Cost of Ownership, Technical specification, and charging portability has a significant impact on the buying intention Electric Vehicle in Indonesia.

The TCO's means that there is a demand for cheaper overall cost Electric Vehicle, this will make a larger volume of consumer, while in the other hands, the Technical Specification means that the consumer does seek and compare the Electric Vehicle performance to the Conventional vehicle, these should be the advantage of the EV as the EV should have an instant performance due to the nature of EV. And lastly, charger portability means that there is demand for easier and simpler charging solution, that can raise the willingness of potential user to the EV.

This should be the primary focus for the current automobiles industry in a manner for transforming to the era of Electric Vehicle, it is hoped that by prioritizing this factor, the industry can lead their way to the new era more efficient and more powerful than the competitor..

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