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Original Article

Analysis of Consumer Preferences Through Conjoint Analysis to Design Competitive Electric Vehicle Financing Packages

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Abstract: *Electric Vehicles (EVs) have become more prominent in Indonesia as a main answer to the mitigation of carbon emissions from the automobile industry. Financial industry players support the growth by providing financial packages designed especially for EVs. This research applies conjoint analysis to identify consumer choice for financing packages provided by one of Indonesia's top automobile financing companies. The study evaluated the five most important attributes, which include interest rates, down payment, tenures of the loan, charging incentives, and extra bonuses. A Choice-Based Conjoint (CBC) model was employed to identify the most significant attributes affecting consumer choice. The findings indicated that interest rates were the most significant attribute (65.50%), followed by extra bonuses (10.60%), charging incentives (9.92%), and tenures (8.75%). The above findings offer actionable recommendations for automaker finance units that seek to craft competitive EV financing offers responsive to consumer aspirations. In addition, the study adds to the general discourse around speeding up the adoption of EVs in Indonesia through customized financing solutions.*

Keywords: *Financing Packages, Charging Incentives, Choice-Based, Conjoint Analysis, Interest Rates.*

I. INTRODUCTION

Focusing on the environmental effects of carbon emissions from transport is crucial in limiting climate change and ensuring the future of the planet [1]. The environmental issue of transport emissions highlights the need for urgent and sustainable solutions to fossil fuel-based transport, including Electric Vehicles (EV), to reduce pollution and ensure public health [2]. The use of EVs has numerous advantages, such as less dependence on foreign oil, improved energy efficiency, and potential for economic growth and innovation [3]. Nations can aid the shift toward sustainable transportation and reduce the harmful effects of transport emissions on the environment by setting supportive policies in place, making investments in the development of infrastructure, and raising awareness of the advantages of EVs [4]. The EV market in Indonesia has undergone significant evolution in recent years, driven by a combination of government policies, technological advancements, and changing consumer preferences. Indonesia, with its large population and growing economy, presents a promising market for EVs, offering opportunities for both domestic and international automakers. The Indonesian government has introduced various initiatives to promote EV adoption, including tax incentives, import duty exemptions, and infrastructure development programs. These initiatives seek to speed up the shift to electric mobility and diminish the nation's reliance on fossil fuels for transport [5]. One of the major hurdles to mass EV take-up is, however, the high initial expenditure of buying EVs in contrast to conventional gasoline-powered cars. Competitive financing packages with incentives are needed to bridge this hurdle and get consumers to switch to EVs. Access to affordable financing not only reduces the cost of financing for consumers but also supports stimulating demand for EVs, hence hastening the transition to cleaner and sustainable transportation options [6]. Competitively priced finance packages customized for EVs are crucial to fueling adoption and market expansion. Conventional financing models, including loans and leases, are unlikely to fully meet the distinctive traits and demands of EV purchasers. Competitive financing deals for EVs need to have lower interest rates, extended repayment terms, and more flexible terms so that EVs are more affordable and accessible to more consumers. Incentives like tax credits, rebates, and grants can also encourage consumers to buy EVs over conventional gasoline cars [7].

II. LITERATURE REVIEW

Conjoint analysis has emerged as a popular research technique for analyzing consumer preferences across industries such as the automotive industry. In recent years, researchers have used conjoint analysis to explore consumer preferences for automobile finance attributes. B. Hondori, H. Javanshir, and Y. Rabani used conjoint analysis to explore consumer preferences among alternative vehicle financing packages [8]. Consumers were found to rank interest rates, loan periods, down payment amounts, and incentives as important considerations when looking at vehicle financing. These observations underscore the need for financial institutions to customize their financing packages in response to the changing needs and desires of consumers in the automobile market. Aside from investigating consumer tastes for particular financing characteristics, academics have also looked

into how contextual elements affect vehicle financing choices. R. Muthukrishnan looked at the influence of socio-economic aspects, including income level, credit record, and demographic traits, in affecting consumer sentiment towards vehicle financing alternatives [9]. The research employed conjoint analysis to gauge the relative significance of these factors and their synergistic effects on consumer choice. The research highlighted the importance of financial institutions' segmentation of the target market and adaptation of their financing products to suit various consumer segments in accordance with their individual needs and preferences. In addition, Li made a comparative study of motor vehicle financing packages provided by various financial institutions such as banks, credit unions, and motor vehicle manufacturers. The research employed conjoint analysis to assess the relative competitiveness of every financing bundle considering consumer preferences and willingness to pay [10]. The financial institutions can reveal areas for differentiation and innovation in their vehicle financing products, hence improving their market position and getting a bigger share of consumers by comparing themselves with industry rivals.

Interest rate is a core element of any finance package and has been found continuously in the literature to be an important driver of consumer choice. Research has confirmed that consumers remain extremely sensitive to changes in interest rates since these have a direct bearing on affordability as well as on the total cost of financing [11]. Down payment provisions significantly influence how consumers view affordability and money commitment. Greater down payments could discourage certain consumers from buying EVs, especially those who have restricted finances or no savings, but less down payment may make the purchase more accessible and appealing to many more. A study established that flexibility in the down payment policy can make consumer decision-making easier and also boost the desirability of EV financing deals [12]. The loan term is used to describe the length of the financing period and affects monthly payments and the total cost of ownership. Research has shown that consumers tend to request longer loan terms to make payments less frequent and ease financial pressure [13]. Charging incentives, for example, offering free or discounted charging at public charging stations, can have a substantial impact on consumer perceptions of EV convenience and cost of ownership. Studies indicate that the presence of charging infrastructure and related incentives can be a powerful driver of EV uptake and reduce range anxiety on the part of prospective buyers [14]. The inclusion of other bonus incentives like cash rebates, tax credits, or rewards for loyalty is also likely to make the product more attractive for consumers and value-enhance the EV financing offerings. Research has indicated that consumers react favorably when incentives are designed to lower initial costs or recurring ownership costs directly, making the EV equivalent to gasoline vehicles in total cost of ownership [15].

In this research, the theoretical framework is about the use of conjoint analysis to capture consumers' preferences in EV financing options. The attributes used in this research are interest rate, down payment, loan term, charging incentives, and extra bonus incentives. These were selected through a literature review, where they were indicated to have an important influence on consumer choice in the automobile finance market.

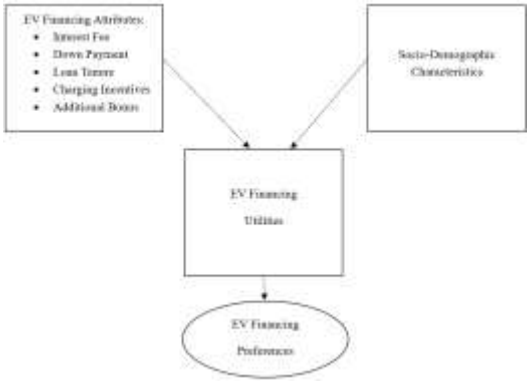

Fig. 1 Conceptual Framework for EV Financing Packages, based on [9 & 11-15]

This study examines primary data sources, focusing on a survey targeted at least 200 respondents [16] who are knowledgeable about or interested in electric vehicles. Respondents needed to be at least 18 years old and willing to use a credit financing scheme to purchase a vehicle. Given the anticipated growth in electric vehicle adoption, this customer survey specifically focuses on potential customers of electric vehicle financing schemes. The online survey was conducted from April to June 2024.

The initial set of questions included Stated Preference (SP) questions, specifically Choice-Based Conjoint (CBC) questions, which involved combinations of specified attribute levels. Capture nonlinear utility functions; each attribute had more than two levels. In this study, the CBC questions asked respondents to select not only their preferred option from a set of three but also their least preferred option, leading to a ranking of the three levels of attributes for the electric vehicle financing scheme

in each set of options. This type of CBC question is commonly used in earlier studies in the field [17].

The experimental attributes of the electric vehicle financing scheme are detailed in Table 3.1. This study compared various aspects of electric vehicle financing schemes, including interest rates (3.25%, 3.65%, and 5.15%), down payments (20%, 25%, and 30%), loan tenures (36 months, 48 months, and 60 months), charging incentives (free charging for one year at selected venues, a 20% discount on charging for the loan tenure period at selected venues, and reward points accumulative for three years at selected venues), and additional bonus incentives (cashback, gold, and smartphones). In total, five attributes with three levels each were evaluated in this study.

Table 1: EV Financing Attributes & Levels for Survey Experiment

Attributes	Level 1	Level 2	Level 3
Interest Fee	3.25%	3.65%	5.15%
Down Payment	20%	25%	30%
Loan Tenure	36 months	48 months	60 months
Charging Incentives	Free charging for 1 year in selected venue	Discount 20% charging for loan tenure period in a selected venue	Reward points accumulated for 3 years in a selected venue
Additional Bonus	Cashback	Gold	Smartphone

This study evaluated existing products in the Indonesian market to determine the interest rate levels. It identified the cheapest and most expensive products and selected a sample product from the intermediate range, resulting in interest rates of 3.25%, 3.65%, and 5.15%. The same sample product was used as a reference for collecting the levels of attributes related to down payments, loan tenures, charging incentives, and additional bonus incentives to ensure consistency.

The CBC questions were developed using a controlled experimental methodology with specific levels allocated to each attribute. Considering the impracticality of respondents evaluating all possible combinations (243 versions), a balanced overlap fractional factorial design was employed. Using Survey Analytics®, a fractional factorial design with a limited number of attribute level variations was created, resulting in 21 versions of the survey (Table 3.2). Each respondent was presented with 7 sets of versions, each containing 3 options.

Table 2: 21 Versions of Stated Preference Scenario to be Chosen by Respondent

Ver	Interest Fee	Down Payment	Loan Tenure	Charging Incentives	Additional Bonus
1	3.25%	20%	36 months	Discount 20% charging for loan tenure period in a selected venue	Smartphone
2	3.25%	20%	36 months	Free charging for 1 year in selected venue	Smartphone
3	3.25%	30%	36 months	Reward points accumulated for 3 years in a selected venue	Gold
4	5.15%	30%	48 months	Free charging for 1 year in selected venue	Gold
5	3.65%	30%	48 months	Discount 20% charging for loan tenure period in a selected venue	Smartphone
6	5.15%	25%	60 months	Reward points accumulated for 3 years in a selected venue	Smartphone
7	3.65%	20%	48 months	Reward points accumulated for 3 years in a selected venue	Cashback
8	5.15%	30%	60 months	Free charging for 1 year in selected venue	Cashback
9	5.15%	25%	48 months	Discount 20% charging for loan tenure period in a selected venue	Gold
10	3.25%	25%	36 months	Discount 20% charging for loan tenure period in a selected venue	Cashback
11	3.65%	20%	36 months	Reward points accumulated for 3 years in a selected venue	Gold
12	3.65%	30%	36 months	Discount 20% charging for loan tenure period in a selected venue	Cashback
13	5.15%	20%	36 months	Free charging for 1 year in selected venue	Smartphone

14	5.15%	30%	48 months	Reward points accumulated for 3 years in a selected venue	Smartphone
15	3.65%	25%	36 months	Free charging for 1 year in selected venue	Gold
16	5.15%	25%	36 months	Reward points accumulated for 3 years in a selected venue	Cashback
17	5.15%	30%	36 months	Discount 20% charging for loan tenure period in a selected venue	Smartphone
18	5.15%	20%	48 months	Free charging for 1 year in selected venue	Cashback
19	3.65%	25%	48 months	Free charging for 1 year in selected venue	Smartphone
20	5.15%	20%	60 months	Discount 20% charging for loan tenure period in a selected venue	Gold
21	3.25%	30%	36 months	Free charging for 1 year in selected venue	Gold

III. RESULTS AND DISCUSSION

A) Socio-Demographic Characteristics

A total of 204 respondents who met the survey criteria and completed the survey were used for further analysis. Among the 204 respondents, 54.90% were men, and 45.10% were women. The largest age groups were those aged 26 to 35 (39.71%) and those over 45 (25.00%). Over half of the respondents (54.90%) are either married or have been married. The majority of respondents live in Jakarta (57.84%) and Tangerang (19.12%). Most respondents are private employees (57.84%), followed by those in various other professions, excluding government employees, entrepreneurs, students, and housewives/househusbands (20.59%). The highest proportion of respondents earn less than 10 million IDR per month (32.35%), with the next largest group earning over 30 million IDR per month (30.88%).

Table 3: Summary of Respondent's Descriptive Statistics

Characteristics	Category	n	%
Gender	Man	112	54.90%
	Woman	92	45.10%
Age	18 – 25 years old	37	18.14%
	26 – 35 years old	81	39.71%
	36 – 45 years old	35	17.16%
	> 45 years old	51	25.00%
Marital Status	Married / Have Been Married	112	54.90%
	Not Yet Married	92	45.10%
Domicile	Jakarta	118	57.84%
	Bogor	9	4.41%
	Depok	10	4.90%
	Tangerang	39	19.12%
	Bekasi	15	7.35%
	Others	13	6.37%
Profession	Government Employee	15	7.35%
	Private Employee	118	57.84%
	Entrepreneur	8	3.92%
	Student	16	7.84%
	Housewife / Housefather	5	2.45%
	Others	42	20.59%
Monthly Earnings	< 10 million IDR	66	32.35%
	10 – 20 million IDR	51	25.00%
	20 – 30 million IDR	24	11.76%
	> 30 million IDR	63	30.88%

B) Choice-Based Conjoint Findings

Table 4 presents the utilities and average importance scores for preferences regarding electric vehicle financing packages. According to the average importance scores, respondents ranked interest fee as the most crucial attribute with 65.50% importance, followed by additional bonus at 10.60%, charging incentives at 9.92%, loan tenure at 8.75%, and down payment at 5.23%.

Table 4: Average Importance Score

Attributes	Utility Value	%
Interest Fee	65.503	65.50%
Down Payment	5.233	5.23%
Loan Tenure	8.745	8.75%
Charging Incentives	9.918	9.92%
Additional Bonus	10.602	10.60%
Total	100.000	100%

Table 5 displays the utility values generated by each attribute, allowing for the determination of utilities assigned to each attribute level. First, respondents preferred the lowest interest fee of 3.25% over the higher interest fee of 5.15%. Second, when it came to down payment, respondents desired a lower amount. Third, for loan tenure, respondents favored the longest available tenure. Fourth, regarding charging incentives, a 20% discount on charging for the loan tenure period at selected venues was the most desired due to the longer term of the incentives, while free charging for one year at selected venues was the least desired. Lastly, among the additional bonuses, Gold had the highest utility value, while Cashback was the least desired.

Table 5: Part Worth Utilities

Attributes	Level	Utility Value
Interest Fee	3.25%	1.367
	3.65%	0.067
	5.15%	-1.434
Down Payment	20%	0.136
	25%	-0.047
	30%	-0.088
Loan Tenure	36 months	-0.214
	48 months	0.054
	60 months	0.160
Charging Incentives	Free charging for 1 year in selected venue	-0.192
	Discount 20% charging for loan tenure period in a selected venue	0.232
	Reward points accumulated for 3 years in a selected venue	-0.041
Additional Bonus	Cashback	-0.172
	Gold	0.281
	Smartphone	-0.108

Table 6 provides a description of the rankings for all 21 combinations that were presented to respondents. With a total utility score of 1.412, combination no. 1, which features an interest fee of 3.25%, a 20% down payment, a 36-month loan tenure, a 20% discount on charging for the loan tenure period at selected venues, and an additional bonus of a smartphone, was found to be the respondents' preferred choice out of the 21 combinations evaluated. In contrast, combination no. 16, with a total utility score of -1.908, was deemed the least desirable by respondents. This combination includes an interest fee of 5.15%, a 25% down payment, a 36-month loan tenure, a charging incentive of cumulative reward points for three years at selected venues, and an additional bonus of cashback.

Table 6: CBC Rankings

Ver	Interest Fee	Down Payment	Loan Tenure	Charging Incentives	Additional Bonus	Utility	Rank
1	3.25%	20%	36 months	Discount 20% charging for loan tenure period in a selected venue	Smartphone	1.412	1
2	3.25%	20%	36 months	Free charging for 1 year in selected venue	Smartphone	0.988	5
3	3.25%	30%	36 months	Reward points accumulated for 3 years in a selected venue	Gold	1.305	2

4	5.15%	30%	48 months	Free charging for 1 year in selected venue	Gold	-1.379	14
5	3.65%	30%	48 months	Discount 20% charging for loan tenure period in a selected venue	Smartphone	0.157	7
6	5.15%	25%	60 months	Reward points accumulated for 3 years in a selected venue	Smartphone	-1.470	15
7	3.65%	20%	48 months	Reward points accumulated for 3 years in a selected venue	Cashback	0.043	8
8	5.15%	30%	60 months	Free charging for 1 year in selected venue	Cashback	-1.726	19
9	5.15%	25%	48 months	Discount 20% charging for loan tenure period in a selected venue	Gold	-0.914	13
10	3.25%	25%	36 months	Discount 20% charging for loan tenure period in a selected venue	Cashback	1.165	3
11	3.65%	20%	36 months	Reward points accumulated for 3 years in a selected venue	Gold	0.228	6
12	3.65%	30%	36 months	Discount 20% charging for loan tenure period in a selected venue	Cashback	-0.175	10
13	5.15%	20%	36 months	Free charging for 1 year in selected venue	Smartphone	-1.812	20
14	5.15%	30%	48 months	Reward points accumulated for 3 years in a selected venue	Smartphone	-1.617	18
15	3.65%	25%	36 months	Free charging for 1 year in selected venue	Gold	-0.105	9
16	5.15%	25%	36 months	Reward points accumulated for 3 years in a selected venue	Cashback	-1.908	21
17	5.15%	30%	36 months	Discount 20% charging for loan tenure period in a selected venue	Smartphone	-1.612	17
18	5.15%	20%	48 months	Free charging for 1 year in selected venue	Cashback	-1.608	16
19	3.65%	25%	48 months	Free charging for 1 year in selected venue	Smartphone	-0.226	11
20	5.15%	20%	60 months	Discount 20% charging for loan tenure period in a selected venue	Gold	-0.625	12
21	3.25%	30%	36 months	Free charging for 1 year in selected venue	Gold	1.154	4

IV. CONCLUSION

The study found that the most influential attribute for consumers when selecting an EV financing package is the interest rate, which carries a utility value of 65.50% importance. This far exceeds other attributes like down payment, loan tenure, and additional incentives. Consumers prefer lower interest rates as they significantly reduce monthly payments and the total cost of financing over time. While attributes such as charging incentives and bonus incentives like gold play a role in the decision-making process, these factors are secondary to the interest rate. The research highlights that consumers are highly price-sensitive, particularly in terms of interest rates, and favor loan tenures that allow them to manage financial burdens over a longer period while maintaining affordable monthly payments.

The optimal combination of financing attributes derived from the conjoint analysis was identified as a package with a 3.25% interest rate, 20% down payment, 36-month loan tenure, a 20% discount on charging for the loan period at selected venues, and an additional bonus of gold. This combination emerged as the most favorable due to its balance between affordability and added value through incentives. While longer loan tenures, such as 60 months, are also preferred, they often come paired with higher interest rates, which can diminish their attractiveness.

Interest Conflicts

The author declares no conflict of interest.

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