

A conceptual Framework Using the Emotional Design Approach to Analyse Consumer Preference in Car Design

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Abstract. The design of a car can evoke feelings of liking or disliking toward the vehicle itself. This study seeks to explain the correlation between consumers and the car as an object when consumers evaluate its design and lead to their conclusion whether they like or dislike. Currently, to obtain such information, business practitioners must conduct a design survey that typically takes three months, involves around 100 respondents, and cost about \$50,000. The proposed framework can significantly reduce energy, time, and cost compared to conducting the design survey. To facilitate understanding, a SUV vehicle includes in a simulation of the proposed correlation framework in its application. This research employs a mixed-method approach, in which quantitative data obtained from questionnaires and vehicle dimension measurements, while qualitative data are gathered from interviews with selected respondents to confirm the validity of the quantitative findings. The results of this study reveal that, in Indonesia, there are at least four main factors influencing individuals in evaluation of car design: Proportion, Face Expression, Novelty, and Overall Design Harmony. The conclusion of whether a person likes or dislikes a car's design is determined by consumer preference, which is influenced by their psychographic profile and past aesthetic experiences.

1 Introduction

Selecting an appropriate product for commercialization or mass production in Indonesia is a critical strategic decision, as an unsuitable model may result in poor market acceptance and significant financial losses. According to the Marketing Mix framework, popularized by E. Jerome McCarthy, marketing performance is influenced by four principal factors: product, price, promotion, and place (distribution) [1]. Among these, the product dimension encompasses quality, functionality, technical specifications, and, in the automotive context, design aesthetics.

Design aesthetics refers to the sensory and formal attributes of a product—such as shape, proportion, materials, surface treatment, texture, and colour—that collectively determine its perceived visual character and appeal [2]. In the automotive industry, design aesthetics encompasses both exterior and interior styling and plays a central role in shaping consumer perception and brand positioning.

Empirical evidence suggests that design constitutes a significant consideration in vehicle purchasing decisions. A survey conducted by *Statista* between July 2021 and June 2022, involving 8,400 adult respondents in the United States, ranked vehicle design eighth among purchase considerations, with a weighting of 32%, following factors such as fuel efficiency and safety [3]. Although not the primary determinant, design remains an influential variable in consumer choice.

A relevant illustration can be observed in the Indonesian premium MPV market in 2024, particularly in the comparison between the Toyota Alphard and the Hyundai Staria. Despite the higher price range of the

Alphard (approximately IDR 1.648–1.737 billion), its sales exceeded 3,690 units, whereas the more affordable Staria (approximately IDR 935 million–1.037 billion) recorded sales of only 105 units [4]. This disparity suggests that factors beyond price—potentially including design aesthetics and brand perception—may significantly influence market performance.

Building upon the preceding discussion, the price differential indicates that the Toyota Alphard is approximately 1.7 times more expensive than the Hyundai Staria. In terms of technical specifications, both vehicles are broadly comparable, with the Staria even offering a functional advantage through its swivel middle seat, enabling a face-to-face seating configuration.



Fig. 1. Toyota Alphard (left) and Hyundai Staria (right)

Despite these similarities, the most salient distinction lies in their exterior design aesthetics. The Alphard projects a luxurious and elegant visual identity, whereas the Staria conveys a futuristic and modern character. Notwithstanding its higher price point, the Alphard has been more favorably received in the Indonesian market. This pattern suggests that consumers may place greater value on a luxurious and prestigious design expression than on futuristic styling cues within the premium MPV segment.

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This observation raises important theoretical questions: What is the relationship between automotive design and consumer preference? Through what mechanisms do specific design elements elicit affective responses such as attraction or aversion? Addressing these questions is essential for understanding how aesthetic attributes influence purchasing decisions.

The phenomenon described above indicates that design considerations should not be underestimated. It may reasonably be hypothesized that a significant correlation exists between consumers' aesthetic preferences and their vehicle purchasing decisions.

At present, manufacturers commonly employ design surveys to evaluate market responses to new styling concepts. Typically, physical prototypes or visual representations are introduced into the target market, followed by structured Design Clinics or Design Questionnaires, and subsequently Focus Group Discussions (FGDs) involving representative consumer segments. The results of these assessments determine whether a product's styling is considered acceptable within the intended market.

Therefore, further systematic investigation is warranted to examine the relationship between consumers and automotive aesthetics, particularly the processes through which individuals develop preferences for specific design characteristics. A deeper understanding of this relationship may enable the development of more efficient and cost-effective evaluation tools capable of generating reliable conclusions within shorter timeframes.

This initiative contributes to the global sustainability agenda articulated by the United Nations through the Sustainable Development Goals (SDGs). [5]

It aligns with **SDG 8: Decent Work and Economic Growth** by enhancing productivity and reducing survey costs, thereby supporting economic growth and poverty reduction.

It also supports **SDG 9: Industry, Innovation, and Infrastructure** by promoting efficiency, innovation, and more resilient institutional practices.

2. Literature Review

2.1. Emotional Design

Because consumers primarily perceive product design through visual stimuli, this study draws upon the Emotional Design framework proposed by Donald Norman in *Emotional Design* [6]. Norman conceptualizes emotional responses to design at three hierarchical levels.

The first level, **Visceral Design**, refers to the immediate and spontaneous affective reaction elicited by a product's appearance. This response operates largely at a subconscious level and is driven by visual attributes such as form, color, and surface treatment. Norman analogizes this phenomenon to "love at first sight." In the automotive context, an aesthetically appealing vehicle may instantly generate a desire for ownership prior to any functional evaluation.

The second level, **Behavioral Design**, emerges through direct interaction with the product. For automobiles, this stage involves experiential factors such as driving performance, control ergonomics,

acceleration, cabin acoustics, and seating comfort. These functional and usability aspects shape user experience and contribute to longer-term evaluative judgments.

The third level, **Reflective Design**, concerns the formation of a sustained emotional and cognitive attachment to the product. Over time, repeated visceral and behavioral experiences may foster brand identification, symbolic meaning, and personal justification of ownership. At this stage, consumers may defend their preferences and generalize positive evaluations to other products within the same brand portfolio.

In addition to Emotional Design theory, this research is informed by the Kansei Engineering approach, developed by Mitsuo Nagamachi [7], which seeks to systematically translate consumers' emotional responses into measurable design parameters, particularly in the context of automotive aesthetics.

2.2 Psychographics

Consumer psychological characteristics are further examined through the concept of psychographics, introduced by Daniel Yankelovich in 1964 [8]. Psychographics refers to the analysis of consumer behavior based on psychological dimensions, including values, attitudes, interests, and lifestyle orientations.

Within a given market segment, consumers often exhibit relatively homogeneous psychographic profiles. For example, individuals within the SUV segment may share comparable lifestyle aspirations and attitudinal patterns, which in turn influence their stylistic design preferences. Consequently, similarities in psychographic traits may partially explain convergent aesthetic tastes within specific vehicle categories.

3. Data and Methods

This study adopts a mixed-methods design integrating quantitative and qualitative approaches. The quantitative component was conducted to assess the validity and reliability of the proposed variables through a structured questionnaire administered to 94 respondents, employing a five-point Likert scale. To complement and enrich the quantitative findings, qualitative data were obtained through in-depth interviews with selected key informants, generating descriptive and interpretative insights in essay form. The correlational mechanism through which individuals arrive at evaluative judgments—namely, liking or disliking a particular design—is conceptualized in the proposed analytical framework (Fig. 2), referred to as the 3P Correlation Model.

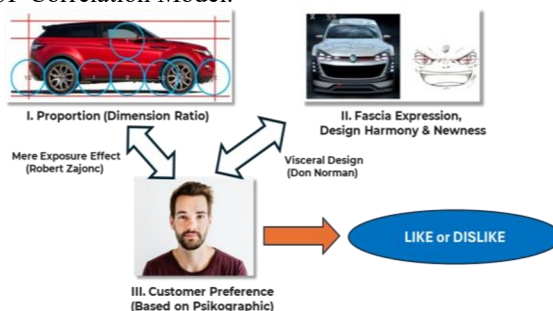


Fig. 2. Correlation Framework of 3P

In evaluating automotive aesthetic design, respondents typically consider four principal visual dimensions: proportion, overall harmony, novelty, and front-end (facial) expression. These visual attributes are cognitively processed through affective mechanisms shaped by prior aesthetic experiences [9] and moderated by individual psychographic characteristics.

To empirically validate the influence of these factors, a structured survey involving 96 respondents was conducted to examine the statistical relationship between perceived design attributes and overall aesthetic preference.

3.1. Proportion Data

The method of understanding proportion is derived from repeated visual exposure to an object, whereby its proportions become clearly perceived and subsequently regarded as correct. As a result, there is no rejection of the proportions observed [10]

To analyze consumer acceptance of proportions, data from 84 vehicles sample were used, including popular SUVs in Indonesia like the Toyota Fortuner and Mitsubishi Pajero. The dataset includes twenty specific dimensions and twelve specific proportional ratio that help to classify vehicles. For example big SUVs category typically have body lengths between 4,700 mm to 5,000 mm.

Table.1 Big SUV, Specific Dimension (mm)

SUV Besar 4700 - 5000 mm									
Cherry Tigo - Hyundai Palisade									
Range Dimensi Spesifik (dalam mm)									
Wheel Base	Front Over Hang		Rear Over Hang		Overall height with Roof Rail (if any)		Tinggi Engine Hood		
A	B		C		D		E		
2710	2900	930	970	1030	1070	1700	1730	1130	1110
Rocker Panel Height (with Side Step if equipped)								Tinggi Side Window	
F1		F2		F3		F4		G	
340	310	300	280	260	270	260	270	460	495
Body Waist Height	Wheel Diameter	Overall Length		Fender to Wheel Rear		Fender to Wheel Front			
H	I	J		K		L			
920	905	720	720	4700	4980	15	25	20	20
Lebar Body (tanpa Spion)	Head Lamp Height	Tinggi dagu Depan		Tinggi dagu Belakang		Tinggi Kaca Belakang			
M	N	O		P		Q			
1860	1975	930	800	320	230	400	360	1290	1230

The table 1. presents dimensional measurements in millimetres, with the Chery Tigo representing the smallest model within the large SUV classification and the Hyundai Palisade representing the largest. Each dimension is denoted alphabetically from A through Q, comprising a total of 20 measured variables.

Table 2. Displays the corresponding proportional ratios. For example, the top-left cell illustrates the ratio of wheelbase to wheel diameter, namely column “A” relative to column “I”, producing a distribution range between 3.76 and 4.03.

Table.2 Big SUV, Specific Ratio Proportion

Range Spesifik Rasio (Proporsi)					
W/B to W/D		FOH to W/D		ROH to W/D	
A/I		B/I		C/I	
3.76	4.03	1.29	1.35	1.43	1.49
Body Waist to Window		OAH / W/D		EHH / WD	
H/G		J/I		E/I	
2.00	1.83	2.36	2.40	1.57	1.54
Rocker Panel to Wheel Center		Body side ratio		Body to Wheel side (avg)	
(I/2) / Average F2+F3		OAL / OAH		(K+L) / 2	
0.78	0.76	2.76	2.88	17.5	22.5
Body Front Ratio		H/L Height Ratio		Rear Glass Ratio	
(D-O)/M		N/E		Q/D	
0.74	0.76	0.82	0.72	0.76	0.71

These findings suggest that the proportional ratio of wheelbase to wheel diameter, as commonly perceived by Indonesian consumers in the large SUV segment lies within the range of 3.76 to 4.03. Ratios deviating from this reference range may be considered uncommon and thus warrant particular attention in vehicle design and evaluation.

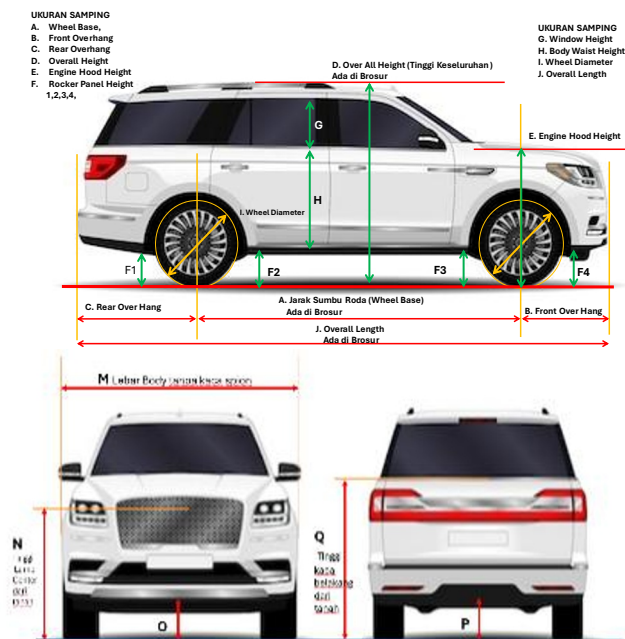


Fig.3. Body measurement area of SUV

Figure 3 on the above, illustrates 20-dimensional parameters of a SUV, as presented on the table 1, which are subsequently analysed and compared through 12 derived proportional ratios shown on the table 2.

3.2. Fascia Expression, Newness and Harmony

The three aspects mentioned above are subjective, depending on the individual’s taste, which is shaped from past aesthetic experiences embedded in memory and by their psychographic profile.

The frontal design or Fascia of an automobile frequently conveys anthropomorphic expressions

analogous to human or animal faces. These perceived expressions may evoke impressions such as anger, intimidation, aggression, friendliness, or playfulness and many others[11]

Newness refers to any form or appearance perceived as novel compared to previously existing vehicles, which also attract consumer attention.

Design Harmony is considered highly important, as consumers expect the absence of irregularities in the design; instead, they anticipate a composition that is well-crafted, balanced, and harmonious.

3.3 Psychographic Data

The psychographic data of Indonesian consumers were obtained through interviews with automotive marketers in Indonesia. In this case, an example is taken from the psychographics of Sport Utility Vehicle (SUV) owners. Eight respondents provided their responses, which can be summarized in the table below.

Table 3. Interview Resume

No	Respondent Name & Position	SUV Psychographic Profile
1	Ryan Ferdinan Tirta – Product Manager – PT Jaecoo Indonesia	They often drive on rough roads and prefer high-stance vehicle designs that showcase their power, with a tough and “macco” (bold, strong-looking) design.
2	Tri Wahono – Director of Corporate Relations – PT Hyundai Motor Manufacturing Indonesia	Touring-oriented, macho, stylish (“perlente”), neat (“nechis”), “mboys,” bold, and able to handle all kinds of road conditions.
3	Ari Novi Wardana – Manager – PT Chery Motor Indonesia	Modern, dynamic, and always wanting to stay up to date with current lifestyle trends.
4	Ben Faqih – Manager – PT Astra Daihatsu Motor	Active and dynamic, often engaging in outdoor activities; enjoys adventure travel; family-oriented, prestige-seeking, and living a modern lifestyle. They typically like advanced technology and sophisticated features, reliable performance, comfortable and modern design. They prioritize practicality and see the vehicle as a reflection of social status. Price and value-for-money matter, and they also consider environmental friendliness and fuel consumption.
5	Adrian Kosim – Section Head – PT Astra Daihatsu Motor	Stylish, proud, validation-seeking, somewhat arrogant, and expressing self-actualization through their vehicle.
6	Rr. Indah Tri Putranti – Manager – PT Honda Prospect Motor	SUV users generally have an active, dynamic, and multitasking lifestyle—balancing career, family, and hobbies such as traveling, outdoor activities, and healthy living. They value comfort, flexibility, and safety, especially for their families. SUVs are chosen not only for functionality but also as symbols of status and achievement. These consumers tend to be rational yet aspirational: they conduct research before purchasing, seek complete technological and safety features, and prefer vehicles that support mobility while reflecting a modern and established lifestyle.

The interview results above are summarized into a psychographic profile of Sport Utility Vehicle (SUV) consumers in the current Indonesian market, as presented in the next table.

Table 4. Indonesia SUV’s consumer psychographic

1	SUV Consumers Psychographic	Personality	Active, Dynamic, Manlike, Tough, Strong, Cool, Independent
		Value of Live	Family Oriented, practical
		Life Style	Modern, Casual, Up to Date
		Interest	Out Door Adventures, recognition/ social affirmation

4. Result & Discussion

Based on a survey conducted with 94 respondents, the results confirm that design harmony, proportion, novelty, and fascia expression emerge as the dominant factor.

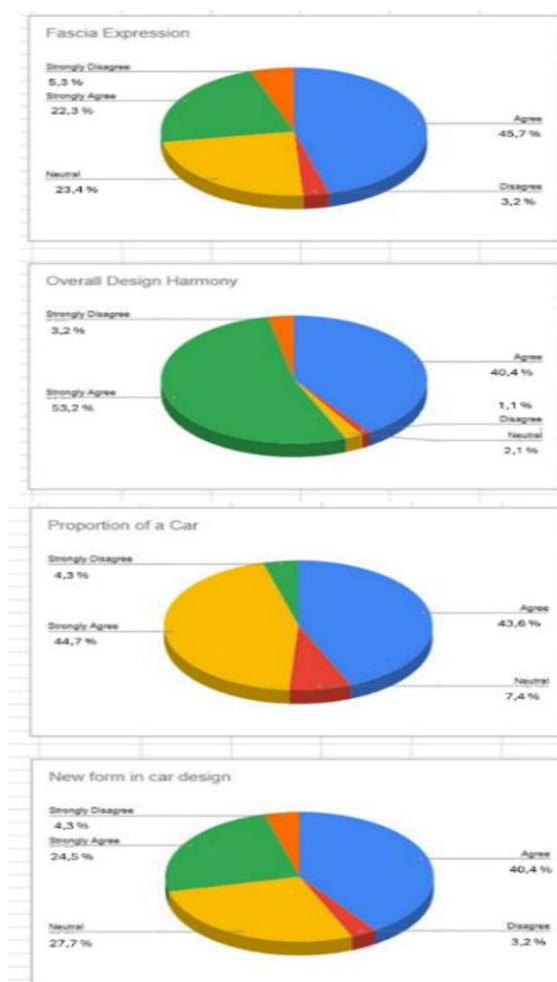


Fig.4. Survey Result of 4 factors.

To ensure the reliability and validity of the questionnaire results, a significance test was conducted using Cronbach’s Alpha [12] for reliability and Pearson’s test for validity [13]. The validity test yielded a significance value of 0.00, which is below the standard threshold of < 0.05, indicating that the correlation is valid. For reliability, the result was 0.752, which exceeds the acceptable standard of > 0.7, demonstrating that the results are reliable.

4.1. The Simulation

Based on the significance of the elements identified above, a correlation framework between humans and automotive design objects is tested to determine whether a car design will be accepted or rejected by its consumers.

For this purpose, a newly launched Chinese SUV, the Dong Feng Warrior M-817, which debuted in June 2025, is used as the case study. This model was chosen to minimize bias, as it is relatively new and has not yet been widely seen by Indonesian consumers.

The stages of analysis include:

1. Analysing the vehicle's proportions using the reference table of proportions presented in Table 1;
2. Examining the perceived expressions conveyed by the vehicle's front-end design
3. Identifying any elements of novelty in the design
4. evaluating whether the overall design composition produces a sense of visual harmony that is considered aesthetically coherent.



Fig.5. Dong Feng Warrior M-817

First, twenty specific sections of the vehicle were measured. The results, as shown in the table on the right, are labelled alphabetically from A to Q, indicating the measurement points in millimetres according to the reference illustrated in Figure 8. The measurements were then compared with one another to derive the specific proportional ratios of the Dong Feng Warrior. The outcomes of this proportional analysis are presented in Table on the right-hand side.

Table 4. Dimension of Dong Feng Warrior (mm)

Ukuran Dimensi Spesifik				
Wheel Base	Front Over Hang	Rear Over Hang	Overall height with Roof Rail (if any)	Tinggi Engine Hood
A	B	C	D	E
3005	766	813	1919	1338
Rocker Panel Height (with Side Step if equipped)				Tinggi Side Window
F1	F2	F3	F4	G
413	337	332	377	433
Body Waist Height	Wheel Diameter	Overall length w/o spare wheel	Fender to Wheel Rear	Fender to Wheel Front
H	I	J	K	L
929	798	4900	20	20
Lebar Body (tanpa Spion)	Head Lamp Height	Tinggi dagu Depan	Tinggi dagu Belakang	Tinggi Kaca Belakang
M	N	O	P	Q
1977	971	380	362	1388

The next step is to compare the specific proportional ratios of the Dong Feng Warrior with the reference ratios obtained from a dataset of large SUVs category that are currently or have previously been marketed in Indonesia, serving as a benchmark for common proportional standards. The results of this comparative analysis are presented in Table 6 below.

Table 6. Proportion Ratio comparison between Dong Feng and Reference

Dong Feng Warrior 817		
Range Spesifik Rasio (Proporsi)		
W/B to W/D	FOH to W/D	ROH to W/D
A/I	B/I	C/I
3.77	0.96	1.02
Body Waist to Window	OAH / W/D	EHH / WD
H/G	D/I	E/I
2.15	2.40	1.68
Rocker Panel to Wheel Center	Body side ratio	Body to Wheel side (avg)
(I/2) / Average F2+	OAL / OAH	(K+L) / 2
0.84	2.55	20
Body Front Ratio	H/L Height Ratio	Rear Glass Ratio
(D-O)/M	N/E	Q/D
0.78	0.73	0.72

Above table compared to below reference table

Reference Proportion Ratio					
Range Spesifik Rasio (Proporsi)					
W/B to W/D		FOH to W/D		ROH to W/D	
A/I		B/I		C/I	
3.76	4.03	1.29	1.35	1.43	1.49
Body Waist to Window		OAH / W/D		EHH / WD	
H/G		J/I		E/I	
2.00	1.83	2.36	2.40	1.57	1.54
Rocker Panel to Wheel Center		Body side ratio		Body to Wheel side (avg)	
(I/2) / Average F2+F3		OAL / OAH		(K+L) / 2	
0.78	0.76	2.76	2.88	17.5	22.5
Body Front Ratio		H/L Height Ratio		Rear Glass Ratio	
(D-O)/M		N/E		Q/D	
0.74	0.76	0.82	0.72	0.76	0.71

The table above shows that three proportional parameters—the front overhang, rear overhang, and rocker panel height (mark with red circle) is significantly deviate from standard large SUV proportions in Indonesia, indicating unique dimensional characteristics of the Dong Feng Warrior.

Further analysis of its front-end (facial) design reveals a distinctly masculine expression, defined by features that convey alertness, readiness, and confidence, as illustrated in the figure 6.



Fig.6. Facia Expression

The novelty of the Dong Feng Warrior’s design is moderate overall, but several elements present new features to the Indonesian market. The most notable are the front and rear turn signal lamps with a cross-shaped (+) design, along with bold, straight, and sharply angled character lines that differ from the smoother, curved surfaces of SUVs like the Toyota Fortuner and Mitsubishi Pajero.



Fig.7. Illustration of Newness and Design harmony

The formal novelties are composed harmoniously through the repetition of shapes and well-balanced composition. No irregularities or inconsistencies were found in the vehicle’s overall design composition. However, one minor note is that the wheel rim design, which incorporates rounded elements, seems slightly inconsistent with the body design theme that emphasizes straight and angular lines.

4.2 Potential Uses & Benefits

The results of this study can be further develop to provide several benefits for automotive businesses and industries in determining:

- a. Supporting decision-making for selecting new vehicle design models to be introduced to the market.
- b. Assisting in determining the product’s selling price related to the new design; if the new design is preferred over the previous model, it may create an opportunity to raise the price to achieve a higher profit margin.
- c. Estimating the potential increase in sales volume; if the new design is more favored than the previous one, this information becomes essential for planning production volumes.
- d. Conducting similar studies for other products in a competitive context; by understanding the position of competing products, companies can establish more accurate price positioning to achieve a competitive pricing strategy.
- e. Identifying necessary design improvements; knowing which parts of the vehicle are less preferred by consumers allows manufacturers to implement design improvements alongside production, such as through Running Changes.
- f. Determining the appropriate timing for a Minor Change or Full Model Change; if the required design improvements are extensive, they may be scheduled for the next Minor Change cycle or even the Full Model Change.
- g. Applying this method can be further developed and provide the above benefits at a relatively low cost, thereby helping reduce overall marketing expenses.
- h. The study can also benefit automotive observers and media in conducting design reviews of new models, which in turn can help

educate the public about the quality of a vehicle’s design.

4.3 Eco Design

This innovation will make the automotive industry more resilient and competitive. This method, which does not require many respondents or staff, reduces the need for human and goods mobility. Such mobility normally consumes energy to power various modes of transportation, which in turn leads to energy waste and increased air pollution. Therefore, this energy saving aspect makes a product of *Eco Design*, where one of its main principles is energy efficiency

In its implementation it does not generate waste as commonly found in conventional automotive design surveys. There are no printed paper questionnaires, no framed design drawings, no plastic folders to be produced, and no name tags for respondents. Everything is waste-free; likewise, there is no leftover waste from venue setups such as partitions, carpets, leveling boxes, and other disposable materials.

Table 7. Implication to environment

No	Current Design Survey	Proposed Method	Implication to Environment
1	Need approximately 100 people of respondent	Not Necessary	Avoid back and forth of 100 people transportation, save energy and pollution
2	Budget is approx. IDR 200 Mio	Estimated IDR 30 Mio	Save IDR 70 Mio can be utilise for other productive activities
3	2 Months (8 weeks) of duration	estimated 1 week	Saving energy/electricity for 7 weeks
4	16 people involvement	3 people including expert	the rest of 13 people can be utilise for other productive activities
5	Trash from the survey activities	Relatively None	waist of wood panel, paper, carpet etc

Eco Design Scheme: Less mobility, energy saving, and air pollution prevention. The implementation of this method also eliminates the need for special rooms for design clinics or Focused Group Discussions as usually required in car design surveys. Only one room is needed to place the car prototype, and the entire process can be completed in just several days. Even from this facility aspect alone, significant savings can be made in electricity consumption for lighting and air conditioning.

5. Conclusion

The correlation between proportions, novelty, facial expression, and harmony significantly influences consumer preferences. Business stakeholders can begin to formulate their strategic approaches based on these findings, as the design of the Dong Feng Warrior has shown positive acceptance within the SUV’s Indonesian market, albeit with several minor considerations. The differences in the proportions of the front overhang, rear overhang, and rocker panel clearance, compared to typical SUVs, positioned the Dong Feng Warrior as a vehicle with a strong Jeep-like character. This distinction is not a disadvantage; on the contrary, it can serve as a strong point in competing with existing SUVs in today’s market. In the end, this proposed method also has positive implications for the environment.

6. Further Study

Furthermore, this study can be further developed into a measurable analytical tool that captures the continuum between feelings of liking and disliking. Such a tool would enable more precise, data-driven decision-making processes within the automotive industry.

To broaden the knowledge, it is also necessary to review relevant references and previous works. Several sources that have been successfully identified include studies conducted by :

1. Book of Sushil Chandra, the author of *Aesthetics, Quantification and Decosntruction : A case study in Motorcycle* [14]
The main idea is to investigate and break down emotional and aesthetic perceptions into measurable design factors.
2. Journal of M. Nagamachi, *Kansei Engineering and its applications in automotive design*, Japanese Journal of Ergonomics. [7]
A technique that translates consumers' feelings and perceptions about a product into design elements that are applied during the design and development of a vehicle.
3. Journal of Corina P. Tarța; Ioan Plăiaș; Luis F. Martinez; Luisa M. Martinez, *The Role of Car Aesthetics on Consumers' Decisions: An Example from Romania, Scientifi. Annals of Economics and Business.*[15]
A questionnaire was administered to 388 respondents and analyzed using SPSS and AMOS within the Romanian automotive market. The findings indicate that not only aesthetic dimensions such as color and shape, but also sound, influence the processing of stimuli. The study reveals a significant and positive relationship between these stimuli and consumers' purchasing decisions.

The previous studies can be used as foundational references for further developing this research.

Author Contributorship

Pradipto Sugondo, :
Conceptualization, Methodology, Investigation,
Resources, Visualization.
Ferric Limano :
Supervision, Validation, Writting Review & Editing

Open Data

Data set is available from Zenodo Repository, DOI 10.5281/zenodo.17433231

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