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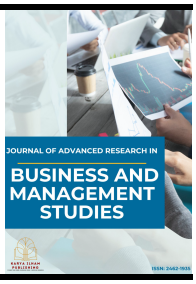

Assessment of Factors Influencing the Purchase Decision Making of Car Using Analytic Hierarchy Process Approach

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ABSTRACT

This study examines the factors that influence consumer car purchasing decisions by applying the Analytic Hierarchy Process (AHP) together with survey-based analysis. Data were collected from 112 respondents through pairwise comparisons and structured questionnaires. The normalized pairwise comparison matrix and derived priority weights identified marketing, product attributes, and brand image as the most influential criteria, while pricing and value perception and quality were found to play supportive roles. Consistency analysis produced a Consistency Ratio (CR) of 0.027, confirming the logical reliability of the judgments. Complementary survey findings supported these results, with respondents citing pricing, brand image, and quality as the primary criteria considered in the initial stage of evaluation. This study provides useful reference points for manufacturers and marketers seeking to engage consumers more effectively and contributes to the broader understanding of multi-criteria decision-making in consumer behaviour research.

1. Introduction

The automotive industry is one of the most competitive global markets, where understanding consumer behaviour is vital for achieving and sustaining competitive advantage. In Malaysia, particularly in the Klang Valley region, car purchasing decisions are influenced by diverse economic, social, and psychological factors. Identifying and prioritizing these factors is crucial for automakers and marketers seeking to improve product offerings, strengthen brand positioning, and design effective marketing strategies.

Car brands play a central role in consumer decision-making. Previous studies highlight that brand image, reputation, and loyalty strongly influence perceptions and purchasing behaviour, as cars are often linked to identity, social status, and lifestyle [1][4]. Brand loyalty fosters repeat purchases and advocacy, while advertising and promotional strategies shape consumer awareness and preferences

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[3]. With the rise of digital technology, online reviews and word-of-mouth recommendations have further amplified the influence of brands on consumer decisions [11]. Despite this, there remains a knowledge gap regarding the relative weight of these factors, particularly in the Malaysian context.

Beyond branding, symbolic meanings, peer recommendations, product variety, and communication strategies also play an important role in shaping consumer preferences [12][13]. Car brands play a critical role in shaping consumer decisions, as they represent not only functional value but also identity, lifestyle, and social status. The strength of a brand lies in its reputation, equity, awareness, marketing efforts, product attributes, and emotional appeal, all of which can create loyalty and differentiate it from competitors [5][12]. Within the automotive sector, brand influence is evident through loyalty, reputation, awareness, and associations with quality, safety, or reliability. Strong brands create emotional connections that encourage repeat purchases and favourable attitudes [2][7][8].

Consumer decision-making itself is influenced by both internal factors such as needs, motivations, attitudes, and prior experiences and external factors including social influences, cultural norms, economic conditions, and marketing communications [4][10]. Effective advertising, promotions, product presentation, and pricing further shape preferences and choices, while peer recommendations and online reviews have become increasingly influential in the digital era [10].

Figure 1 illustrates the conceptual framework for this study. The framework categorizes the factors influencing consumer decision-making into independent and dependent variables. The independent variables comprise ten factors identified from the literature: brand image, reputation, marketing, communication strategies, product attributes, quality, pricing, value perception, social influence, and recommendations. These factors collectively shape the dependent variable, which is defined as consumer decision-making on car purchasing.

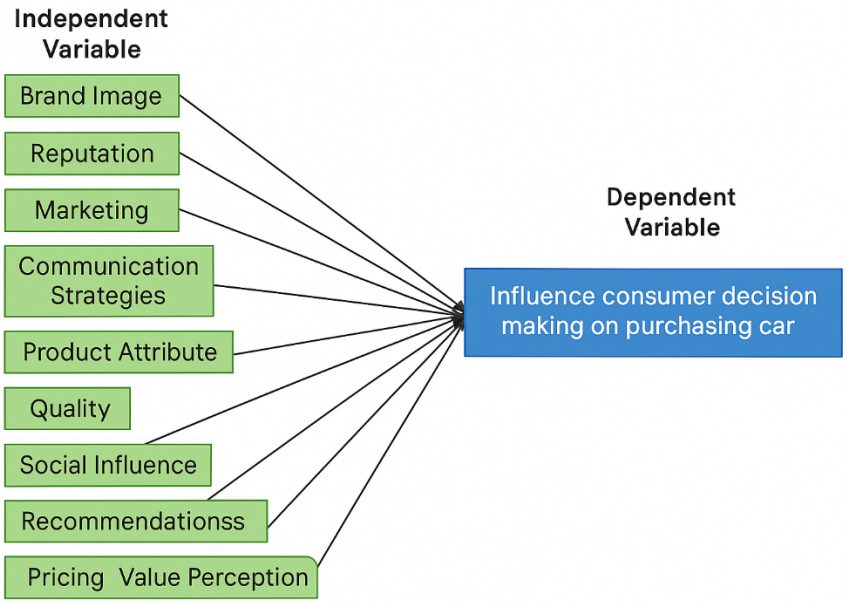

Fig. 1. Conceptual framework

The framework offers a structured approach to understanding the complex interplay between marketing, brand-related, and consumer perception factors, and explains how these variables collectively influence the final car purchase decision. By organizing the variables in this manner, the study establishes a clear analytical foundation for applying the Analytic Hierarchy Process (AHP) to evaluate and rank the significance of each factor.

The absence of a structured decision-making framework often results in inconsistent or suboptimal which may struggle to fully understand and influence consumer purchasing behaviour. The study aims to address these challenges by identifying the significant factors that influence consumer car purchase decisions, and rank these factors according to their relative importance using AHP. The Analytic Hierarchy Process (AHP) is a widely used Multi-Criteria Decision-Making (MCDM) technique that helps evaluate and prioritize multiple factors in complex decision contexts. AHP provides a structured and systematic framework for breaking down decision problems into a hierarchy of goals, criteria, and alternatives. Through pairwise comparisons, it enables decision-makers to assess the relative importance of factors, derive priority weights, and check for consistency in judgments. Rather than prescribing a single "correct" option, AHP empowers decision-makers to select alternatives that best align with their objectives and contextual understanding. This makes it especially valuable for studies that require ranking criteria and identifying the most influential factors, such as consumer decision-making in car purchases.

By understanding these criteria, we can provide a more structured framework to help consumers make better- informed choices. This finding will not only aids consumer in their selection process but provide valuable insights for automotive companies to enhance their marketing strategies, improve consumer engagement, and align their product development efforts with the needs and expectations of Malaysian car buyers.

2. Methodology

This study employed a quantitative research design to examine the factors influencing car purchase decisions in the Klang Valley region. A systematic literature review was first conducted to establish a conceptual framework comprising ten criteria are brand image, reputation, marketing, communication strategy, product attributes, quality, social influence, recommendation, pricing, and perception. These criteria served as the independent variables shaping consumer decisions.

Primary data were collected through a structured questionnaire administered to 90 car users, consisting of demographic questions and pairwise comparisons of the identified factors. The Analytic Hierarchy Process (AHP), a multi-criteria decision-making technique, was applied to analyse the responses by structuring the problem into a hierarchy, conducting pairwise comparisons, normalizing the results to derive priority weights, and performing a consistency ratio check to ensure reliability. The analysis applied the Analytic Hierarchy Process (AHP) by structuring the decision problem into two level hierarchy to ensure clarity and systematic evaluation.

At the first level, the primary goal was defined as identifying and ranking the factors that influence consumer car purchase decisions. The second level consisted of the decision criteria, represented by the ten factors identified through the literature review which are brand image, reputation, marketing, communication strategy, product attributes, quality, social influence, recommendation, pricing, and perception.

The Analytic Hierarchy Process (AHP), developed by Saaty [6], is a structured decision-making approach designed to prioritise multiple criteria and alternatives. It is particularly effective when decisions involve both quantitative and qualitative factors [9]. Data were obtained from a structured questionnaire randomly distributed to car users in the Klang Valley, focusing on ten identified criteria:

brand image, reputation, marketing, communication strategy, product attributes, quality, social influence, recommendation, pricing, and perception. To analyse the responses, a pairwise comparison matrix was developed, where each criterion was systematically compared against others using a scale from 1 to 9.

The preference levels were expressed as numerical values that indicated the relative rank or position of each criterion. A higher numerical value indicated a stronger preference for one criterion over another, while a lower value reflected preference. This structured comparison enabled the relative importance of each factor to be quantified and ensured consistency in the evaluation process. The resulting preference matrix provided a comprehensive representation of respondents' judgments, allowing for the calculation of priority weights and rankings. The resulting judgments are normalised to derive priority weights, and a consistency check is performed to ensure reliability. This structured approach ensured consistency in the comparisons and facilitated clear understanding of consumer preferences, supporting automotive companies in refining marketing strategies and aligning product development with consumer priorities.

The questionnaire was structured in two main sections to support the objectives of this study were demographic information and AHP pairwise comparison. The first section collected respondents' background information, including age, gender, type of car currently owned, and the initial criterion considered when purchasing a car. In the second section, respondents were asked to perform pairwise comparisons of the identified criteria using the Analytic Hierarchy Process (AHP) framework. Each respondent rated the relative importance of the factors on a scale of 1 to 9, where 1 represented equal importance and 9 represented extreme importance. This approach enabled the quantification of consumer judgments, allowing for the calculation of priority weights and rankings of the factors influencing car purchase decisions.

3. Results

3.1 Respondents Demographics

The data was gathered through Google Forms, which provided an efficient way to reach a broad range of respondents. A total of 58 responses were obtained, yielding an acceptable response rate of 52%. These responses were validated and considered suitable for analysis. The demographic distribution of respondents was relatively balanced in terms of gender, comprising 40% female and 57% male participants. In terms of age, the largest proportion of respondents fell within the 25–34 years category, representing the dominant group in the sample. Furthermore, a majority of the respondents (58.9%) reported owning a local car as opposed to a foreign brand, reflecting a strong preference for domestic automotive options.

In addition to the AHP results, respondents were directly asked which criterion they would first consider before buying a car. Out of 112 responses (Figure 2), the majority selected pricing and value perception (25%), followed by brand image (23.2%) and quality (23.2%), product attributes (18.7%) were also cited as a key consideration, while reputation, marketing, and social influence received minimal attention, together accounting for less than 10%.

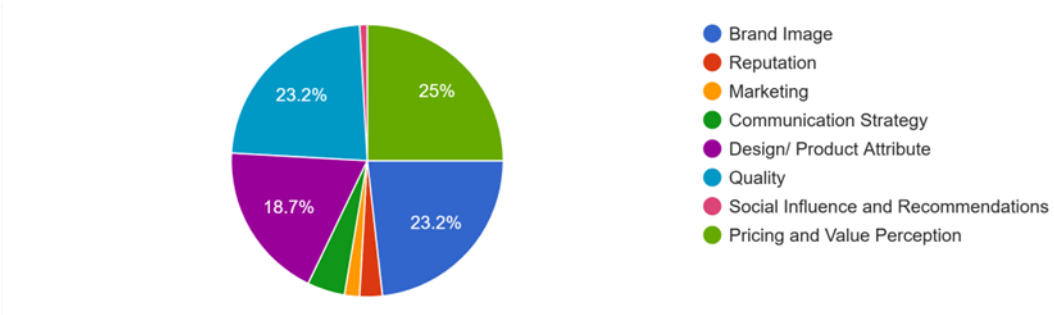

Fig. 2. Survey results: initial criteria influencing car purchase decisions

3.2 AHP Analysis

The questionnaire data were analysed by converting the scores into matrix form as shown in Table 1, allowing the responses to be quantified according to the relative preferences of the participants. Once all comparisons and ratings were recorded, the column sums were calculated to derive the relative weights of each criterion. For instance, if a respondent preferred brand image over reputation, a score of 2 was assigned to brand image, indicating it was twice as significant as reputation; correspondingly, reputation received a reciprocal score of 1/2. This shared structure ensured consistency within the matrix.

Table 1
Pairwise comparison matrix

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
Brand Image	1.00	2.47	0.97	1.04	0.92	0.97	1.07	2.76	1.00	0.95
Reputation	0.41	1.00	0.34	0.99	1.04	0.92	1.04	2.81	0.98	0.96
Marketing	1.03	2.97	1.00	0.96	2.73	0.94	0.98	2.85	0.93	0.96
Comm.Strategies	0.96	1.01	1.05	1.00	0.96	0.89	1.12	2.72	1.05	0.92
Product Attributes	1.08	0.96	0.37	1.04	1.00	2.56	1.50	3.08	0.96	0.95
Quality	1.03	1.09	1.06	1.13	0.39	1.00	1.62	3.44	1.04	1.02
Social Influence	0.93	0.96	1.02	0.90	0.67	0.62	1.00	2.72	0.95	0.89
Recommendations	0.36	0.36	0.35	0.37	0.32	0.29	0.37	1.00	0.32	0.31
Pricing	1.00	1.03	1.07	0.96	1.04	0.96	1.06	3.17	1.00	0.94
Value Perception	1.06	1.04	1.05	1.09	1.05	0.98	1.12	3.22	1.07	1.00

To determine the priority weights from the raw pairwise comparison data, the judgment matrix was normalized. Each element in a column was divided by the sum of that column, which adjusted for differences in scale and allowed the criteria to be expressed in a comparable manner. As a result, the values in each column summed to one, providing a proportional representation of the relative importance of each criterion. The values in the matrix represent the normalized weights or contributions of each criterion to the overall evaluation as shown in Table 2.

Table 2
Normalised pairwise comparison matrix

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
C1	0.11	0.19	0.12	0.11	0.09	0.10	0.10	0.10	0.11	0.11
C2	0.05	0.08	0.04	0.10	0.10	0.09	0.10	0.10	0.11	0.11
C3	0.12	0.23	0.12	0.10	0.27	0.09	0.09	0.10	0.10	0.11
C4	0.11	0.08	0.13	0.11	0.09	0.09	0.10	0.10	0.11	0.10
C5	0.12	0.07	0.04	0.11	0.10	0.25	0.14	0.11	0.10	0.11
C6	0.12	0.08	0.13	0.12	0.04	0.10	0.15	0.12	0.11	0.12
C7	0.11	0.07	0.12	0.09	0.07	0.06	0.09	0.10	0.10	0.10
C8	0.04	0.03	0.04	0.04	0.03	0.03	0.03	0.04	0.03	0.03
C9	0.11	0.08	0.13	0.10	0.10	0.09	0.10	0.11	0.11	0.11
C10	0.12	0.08	0.13	0.12	0.10	0.10	0.10	0.12	0.11	0.11

The summary of criteria, their respective weights, ranks, weighted sum and ratio are given in Table 3. By averaging the values in each row, the priority or weight of each criterion is determined. This criteria weight provides a clear and quantified representation of the relative importance of the different criteria in the overall decision-making process. The priority weights for various criteria are summarized in the table provided.

After determining the normalized pairwise comparison matrix and deriving the row average weights, the next step in the Analytic Hierarchy Process (AHP) is to compute the weighted sum and weighted ratio. This is achieved by multiplying the original pairwise comparison matrix by the priority weight vector (row averages). Each row's weighted sum was then divided by the respective criterion weight to generate the weighted ratio or λ (lambda) values, from which the average λmax was obtained. Once the weighted sum matrix was obtained, the next step was to divide each element of the weighted sum matrix by its corresponding priority weight to obtain the weighted ratio or λ (lambda) values. These values form the basis for the consistency test.

Table 3
Summary of criteria weights, rankings, and consistency ratios

Criteria	Criteria weights	Criteria rank	Weighted sum	Weighted ratio, **λ**
Brand image	0.11	3	1.18	10.42
Reputation	0.09	9	0.90	10.31
Marketing	0.14	1	1.42	10.63
Communication strategies	0.10	7	1.05	10.34
Product attributes	0.12	2	1.21	10.36
Quality	0.11	5	1.11	10.23
Social influence	0.09	8	0.94	10.29
Recommendations	0.03	10	0.36	10.33
Pricing	0.10	6	1.08	10.35
Value perception	0.11	4	1.12	10.33

The criteria weights show a clear prioritization of criteria in car-purchase decision making where marketing (0.14) ranks first, followed by product attributes (0.12) and brand image (0.11). A second cluster of near-equal importance comprises value perception (0.11), quality (0.11), pricing (0.10), and communication strategies (0.10), whose weights differ only marginally (<0.01), suggesting these factors jointly shape perceived value and risk at the point of choice. Social influence (0.09) and

reputation (0.09) are moderately influential, while recommendations (0.03) are clearly least influential in the group consensus.

To validate the reliability of the priority weights obtained through the row-average method, the Consistency Ratio (CR) are used to assess whether the judgments provided are logically consistent and reliable for decision-making. In AHP, consistency is critical to ensure that the pairwise comparisons made by respondents are logically coherent. The average of these λ values provides the maximum eigenvalue λ_{max}. From these ratios, the maximum eigenvalue was estimated at $\lambda max=10.36$. Using λ_{max}, the Consistency Index (CI) is calculated with the formula:

$$CI = (\lambda_{max} – n) / (n – 1)$$

Where n represents the number of criteria, the Consistency Ratio (CR) is computed to evaluate the logical coherence of the pairwise comparisons. The CR is obtained by dividing the Consistency Index (CI) by the corresponding Random Index (RI), the latter of which depends on the size of the matrix. In this study, the calculated CI was 0.040. Given that the RI value for a 10 × 10 matrix is 1.49, the resulting CR was 0.027. The aggregated AHP analysis indicating judgments were highly consistent with ($CR < 0.10$) which falls well below the recommended threshold of 0.10 [6] and considered highly consistent, thereby validating the reliability of the derived weights. The consistency outcome supports the earlier ranking of criteria, where marketing, product attributes and brand image emerged as the most influential drivers of consumer car-purchase decisions. A result comparison between initial screening stage survey responses in Figure 2 and the AHP-derived weights in Table 3 highlight that consumers consistently prioritize **brand image** as the important criteria when making car purchasing decisions. This suggests that automotive companies should focus on maintaining high standards of product performance, while simultaneously investing in strong branding strategies. These elements act as the primary drivers of consumer interest and purchase intent and neglecting them could result in significant market disadvantages.

4. Conclusion

This study used the Analytic Hierarchy Process (AHP) together with survey analysis to examine the main factors influencing consumer car purchasing decisions. The results showed that marketing, product attributes, and brand image were the most influential criteria, while pricing and value perception and quality served as supportive factors that still played a meaningful role in decision-making. The findings also indicated a two-stage consumer decision process: an initial screening phase, followed by a refinement phase, in which brand image carried greater weight. The Consistency Ratio (CR) was calculated at 0.027, which is well below the acceptable threshold of 0.10, confirming that the results are logically consistent and reliable. These results provide practical guidance for industry practitioners. In particular, the findings can be used as a reference for car manufacturers and marketers who aim to target this demographic, enabling them to design marketing strategies that emphasize product attributes, brand image, quality and pricing, while also reinforcing communication and reputation to strengthen consumer trust.

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