Evaluation of 32 mm Automatic Hair Curlers on Shopee Using AHP Customer Reviews

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Abstract

This study aimed to evaluate 32 mm automatic hair curler products available on the Shopee e-commerce platform by applying the Analytic Hierarchy Process (AHP) combined with customer review analysis. The data were obtained through direct observation of three products with similar characteristics. The collected data included product ratings, number of reviews, star-based review distribution, sales volume, and price. Sentiment analysis was conducted by categorizing customer reviews into positive, neutral, and negative groups based on their star distribution. The AHP method was used to determine the priority weights of each evaluation criterion. The results showed that sales volume was the most influential criterion in the decision-making process, followed by product ratings and the number of reviews. The final AHP score revealed that the MAIMEITE product achieved the highest value, making it the most recommended option. This study demonstrated that integrating AHP with customer review analysis provided an objective, systematic, and data-driven approach to product evaluation.

Keywords: *Analytic Hierarchy Process, Shopee, e-commerce, customer reviews, product evaluation.*

1. Introduction

The rapid advancement of information technology has accelerated the growth of e-commerce platforms, transforming consumer purchasing behavior across various product categories[1][2]. In recent years, online marketplaces have become a primary channel for purchasing beauty and personal care products due to their convenience, accessibility, and extensive product variety[3]. As a result, consumers are increasingly exposed to a wide range of alternatives that differ in terms of quality, price, and popularity[4].

Among beauty and personal care products, automatic hair curlers have gained significant attention, particularly 32 mm models that are widely used to create natural and long-lasting curls. On the Shopee e-commerce platform, numerous 32 mm automatic hair curler products are offered by different sellers, often with similar functional features but varying in price, sales volume, customer ratings, and brand reputation. This condition presents challenges for consumers in identifying the most suitable product based on objective considerations.

Customer reviews have emerged as an essential source of information in online shopping environments, as they reflect user experiences, product performance, and satisfaction levels. Several studies indicate that online customer reviews and ratings significantly influence consumer purchasing decisions on e-commerce platforms such as Shopee and Tokopedia[5], [6], [7]. However, the large number of reviews and diverse evaluation indicators may lead to subjective and inconsistent decision-making.

To address these challenges, a systematic and objective decision-support approach is required. Multi-criteria decision-making methods are particularly useful in situations where multiple factors must be considered simultaneously. One of the widely used methods is the Analytic Hierarchy Process (AHP), which enables the decomposition of complex decision problems into a hierarchical structure of criteria and alternatives and supports rational decision-making [8], [9].

Previous studies have demonstrated the effectiveness of AHP in various decision-making contexts, including service quality assessment and product evaluation. Chang et al. integrated AHP with service quality analysis to identify valuable customer needs, showing that AHP provides reliable prioritization of

evaluation criteria[10][11]. Other studies have also applied AHP in e-commerce-related decision-making, confirming its applicability in analyzing consumer behavior and platform selection[12], [13].

In addition to decision-making methods, sentiment and review analysis provides valuable insights derived directly from user feedback. Research on sentiment analysis of e-commerce user reviews indicates that star-based review distribution can effectively represent customer satisfaction and preferences on online platforms such as Shopee[14], [15]. These indicators can be integrated with decision-support methods to enhance evaluation accuracy[16].

Therefore, this study aimed to evaluate and rank 32 mm automatic hair curler products available on the Shopee e-commerce platform by applying the Analytic Hierarchy Process combined with customer review analysis. The contribution of this research lies in proposing an objective, systematic, and data-driven product evaluation model that supports consumer decision-making and demonstrates the applicability of AHP in the context of e-commerce product assessment.

2. Method

2.1 Research Design

This study employs a descriptive quantitative research design aimed at supporting multi-criteria decision-making in product selection. The quantitative approach is applied because the analysis is based on numerical data obtained from an e-commerce platform, including product ratings, number of reviews, distribution of star ratings, product prices, and sales volume.

The research is designed to evaluate and compare several alternative products using structured criteria derived from customer review data and product information. The Analytic Hierarchy Process (AHP) is adopted as the analytical method to accommodate decision-making problems involving multiple criteria with different levels of importance. The use of AHP enables the systematic structuring of the decision problem into a hierarchical framework, followed by the determination of criteria weights and the calculation of preference scores for each alternative.

This research follows a non-experimental design, as no variables are manipulated during the study. All data are collected through direct observation of existing product information on the Shopee platform. The research design emphasizes an objective evaluation process by transforming qualitative customer feedback into quantitative indicators that can be analyzed mathematically.

2.2 Research objek

The object of this research is automatic curling iron products with a diameter of 32 mm marketed on the Shopee e-commerce platform. The study focuses on selected alternative products from the Mangoman, MAIMEITE, and SCUDOS brands, which provide sufficient and comparable information for quantitative analysis based on customer reviews and product attributes.

2.3 Data Sources

Data sources refer to information that has been systematically collected and documented to support the analysis and discussion of this research. This study utilizes both primary and secondary data as the main sources of information.

1. Primary Data

The primary data were obtained through direct online observation of product information available on the Shopee e-commerce platform. The observed data include product ratings, number of customer reviews, star-rating distribution, product prices, and sales volume for each selected automatic curling iron product.

Data collection was conducted by systematically recording information displayed on the official Shopee product pages during the observation period from October to November 2025. The recorded numerical data served as the basis for evaluating both criteria and alternatives in the Analytic Hierarchy Process (AHP).

Sales volume data were recorded based on the total number of units sold as displayed on the Shopee product page at the time of observation, which represents cumulative sales information provided by the

platform. Product price data refer to the listed selling price shown on the product page during the observation period.

To enhance data transparency and research reproducibility, the observed products were obtained from official Shopee product listings with verified seller status. The selected products were accessed through the following URLs during the observation period (September–October 2025): SCUDOS (https://id.shp.ee/FDgVdjz), MAIMEITE (https://id.shp.ee/uLpvv9q), and Mangoman (https://id.shp.ee/3R2zw1n). All numerical data, including product ratings, number of reviews, star-rating distribution, product prices, and sales volume, were recorded directly from these pages at the time of observation. This procedure ensures that the data used in the analysis are traceable, verifiable, and accurately reflect the information provided by the Shopee platform.

All numerical data used to construct AHP pairwise judgments were extracted directly from official Shopee product pages and processed using a structured normalization and conversion procedure.

The selected products were identified based on consistent availability, comparable product specifications (32 mm diameter), and verified official seller listings on the Shopee platform.

2. Secondary Data

Secondary data consist of supporting information obtained from various literature sources, including scientific journal articles, books, and previous studies related to multi-criteria decision-making, the Analytic Hierarchy Process (AHP), and product evaluation based on customer reviews.

2.4 Variables. Hierarchy, and AHP Formulation

2.4.1 Evaluation Variables and Criteria

The variables used in this study function as evaluation criteria in the AHP-based decision-making process. These variables are derived from product information and customer review data available on the Shopee e-commerce platform and are used to assess and compare alternative automatic curling iron products.

The evaluation variables and their corresponding indicators are presented in Table 1. The variables consist of product rating, number of customer reviews, distribution of star ratings, product price, and sales volume. These variables represent quantitative indicators that reflect customer perception, market demand, and economic considerations in product selection.

Based on their impact on decision-making, product rating, number of customer reviews, distribution of star ratings, and sales volume are categorized as benefit criteria, as higher values indicate better product performance. In contrast, product price is categorized as a cost criterion, as lower prices are more favorable to consumers. These variables serve as the basis for pairwise comparisons and weighting in the Analytic Hierarchy Process (AHP) analysis.

Table 1. Variables and Evaluation Indicator

Code	Variable/Criterion	Indicator Description	Type
C1	Produk Rating	Average rating score given by customers for each product	Benefit
C2	Number of Customer Reviews	Total number of reviews submitted by customers	Benefit
C3	Star Rating Distribution	Proportion of five-star reviews compared to total reviews	Benefit
C4	Product Price	Selling price of the automatic curling iron product	Cost
C5	Sales Volume	Number of products sold on the Shopee platform	Benefit

2.4.2 Hierarchical Structure of the Decision Model

The hierarchical structure of the decision model is developed to represent the product selection problem in a systematic manner as the basis for implementing the Analytic Hierarchy Process (AHP). This structure organizes the decision elements into hierarchical levels to clearly define the relationships between the decision goal, evaluation criteria, and alternative products.

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The decision hierarchy consists of three main levels: Level 1 (Goal), which is the selection of the best automatic curling iron product; Level 2 (Criteria), which includes product rating, number of customer reviews, distribution of star ratings, product price, and sales volume; and Level 3 (Alternatives), which comprise Mangoman, MAIMEITE, and SCUDOS products. The AHP hierarchical structure is presented in the form of a diagram in this subsection to visually illustrate the relationships among the decision components.

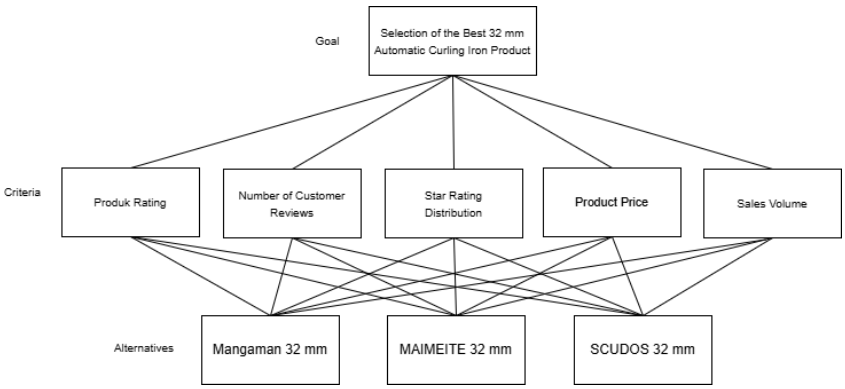

Fig 1. Hierarchical Structure Diagram

2.4.3 AHP Formulation and Data Analysis Procedure

The Analytic Hierarchy Process (AHP) was applied to evaluate and rank automatic curling iron products in a structured and transparent manner. To reduce subjectivity, all pairwise judgments in this study were generated using a data-driven approach, relying exclusively on numerical information obtained from the Shopee platform rather than expert opinions or respondent surveys.

1. Construction of Pairwise Comparison Matrices

Pairwise comparison matrices were constructed to assess the relative importance of the evaluation criteria, namely product rating, number of reviews, star-based sentiment, sales volume, and product price. The raw data for each criterion were collected directly from the official Shopee product pages during the defined observation period.

Prior to constructing the pairwise comparison matrices, the collected criterion values were aggregated across all evaluated products and normalized to ensure comparability among different measurement scales. The relative importance between two criteria was determined by comparing their normalized contributions to overall product performance.

These relative differences were then converted into Saaty's fundamental scale (1–9) using a structured rule-based mapping. A value of 1 was assigned when two criteria showed nearly identical normalized contributions, indicating equal importance. Values of 3, 5, and 7 represented moderate, strong, and very strong importance, respectively, when one criterion consistently exhibited a higher contribution than another. The reciprocal values were applied automatically for inverse comparisons to preserve matrix consistency.

The resulting pairwise comparison matrix of criteria is presented in Table 2.

Table 2. Pairwise Comparison Matrix of Criteria

Criteria	Product Rating	Number of Reviews	Sentiment	Sales Volume	Product Price
Product Rating	1	1	3	1/3	5
Number of Reviews	1	1	3	1/3	5
Sentiment	1/3	1/3	1	1/5	3
Sales Volume	3	3	5	1	7
Product Price	1/5	1/5	1/3	1/7	1

The values presented in Table 2 were derived from systematic comparisons of normalized Shopee data rather than subjective judgment. Sales volume consistently demonstrated higher normalized values

compared to other criteria, reflecting stronger market acceptance, and was therefore assigned higher importance levels. Product rating and number of reviews exhibited nearly identical normalized contributions across all alternatives, justifying their equal importance. Product price showed relatively lower influence on overall performance and was consequently assigned lower importance values. This conversion process ensures that the pairwise judgments are logical, transparent, and reproducible.

2. Matrix Normalization

Each element in the comparison matrix was divided by the sum of its column to normalize the values. This step ensures all values are proportionally represented, allowing consistent calculation of priority weights.

$$Normalized\ value = \frac{Original\ Matrix\ Element}{Sum\ of\ column}$$

3. Priority Weights Calculation

Priority weights (eigenvectors) for each criterion and alternative were calculated as the average of normalized row values. The weights quantify the relative importance of criteria and the relative performance of alternatives:

$$wi = \frac{\sum_{k=1}^{n} Normalized\ \ element_{ik}}{n}$$

These weights serve as the fundamental indicators for evaluating and ranking the alternatives.

4. Consistencey Verification

Consistency of pairwise comparisons is crucial to ensure logical judgments. Consistency Index (CI) and Consistency Ratio (CR) were computed:

$$CI = \frac{\lambda_{max} - n}{n - 1}$$

$$CR = \frac{CI}{RI}$$

Where λ_{max} denotes the maximum eigenvalue of the comparison matrix, n represents the number of criteria, and RI is the Random Index. A CR ≤ 0.10 indicates an acceptable level of consistency. In cases where CR > 0.10, adjustments were made by reviewing and revising the comparisons.

5. Sentiment Percentage Analysis

Sentiment analysis of customer reviews was conducted to complement the quantitative evaluation of automatic curling iron products. Before calculating the sentiment percentages, customer reviews were classified into three categories based on star ratings, as shown in Table 3:

Table 3. Sentiment Categories Based on Star Ratings

Sentiment Category	Star Rating
Positive	5-4
Neutral	3
Negative	1-2

After classification, the sentiment percentage for each alternative was calculated using the formula:

$$Sentiment\ Percentage = \frac{Number\ of\ Reviews\ per\ Sentiment\ Category}{Total\ Number\ of\ Reviews}$$

This step enhances the reliability of evaluation by integrating customer perception with numerical performance indicators.

6. Alternative Evaluation and Ranking

After obtaining consistent criteria weights, each alternative's relative performance was calculated for every criterion. Eigenvector values from alternative matrices were multiplied by the corresponding criteria weights:

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$$Si = \sum_{j=1}^{n} w_j \times a_{ij}$$

Here, Si represents the final score of alternative i, w_j is the weight of criterion j, a_{ij} is the eigenvector value of alternative iii under criterion i, and n is the total number of criteria.

2.5 Research Procedure

The research procedure is illustrated in Figure 2. as a flowchart. The diagram presents a clear and systematic overview of the research steps, from data collection to final decision-making.

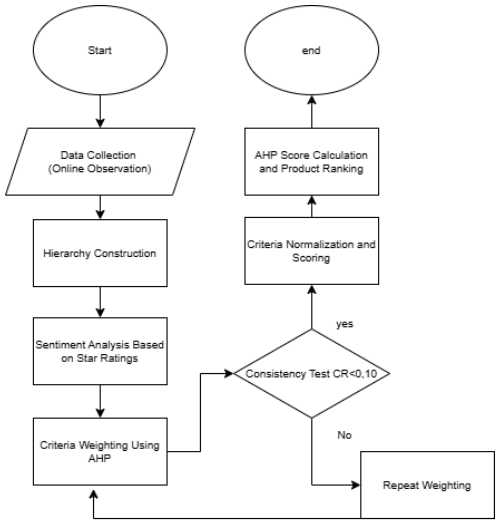

Fig 2. Research Procedure Flowchart

The flowchart summarizes the process into seven main stages: data collection, hierarchy construction, sentiment analysis, criteria weighting, normalization, AHP score calculation, and final ranking. Each stage is interconnected, showing the sequence and flow of the study. Detailed calculations, including pairwise comparisons, weight determination, and consistency checks.

3. Result and Discussion

3.1 Result

3.1.1 Data Collection and Online Observation Results

Data collection was conducted through direct online observation on the Shopee e-commerce platform during the period October-November 2025. The research objects consisted of three automatic hair curler products with a diameter of 32 mm, namely Mangoman, MAIMEITE, and SCUDOS, which were selected based on product availability, popularity, and completeness of review information.

The observed data included product ratings, number of customer reviews, star-rating distribution, sales volume, and product prices. All data presented in this section represent raw data obtained directly from the official Shopee product pages at the time of observation and serve as the basis for subsequent analysis.

Sales volume values correspond to the cumulative number of units sold as displayed on each product page, while product prices represent the listed prices shown during the observation period. Differences among products reflect variations in market acceptance, customer engagement, pricing strategies, and consumer purchasing behavior.

Table 4. Online Observation Data of Automatic Hair Curler Products

Criteria	Mangoman	MAIMEITE	SCUDOS
Produk Rating	4.8	4.8	4.9
Number of Customer Reviews	642	14,400	180
★5 Reviews	557	12,200	166
★4 Reviews	51	1,500	10
★3 Reviews	19	421	2
★2 Reviews	2	102	1
★1 Reviews	13	163	1
Product Price	>1,000	>10,000	>1,000
Sales Volume	62,325	115,200	95,200

Based on Table 4, MAIMEITE exhibits the highest number of customer reviews and sales volume, indicating strong market penetration and high purchasing frequency. SCUDOS records the highest average product rating despite having fewer reviews, suggesting consistent customer satisfaction. Mangoman offers the lowest product price, making it more competitive from a cost perspective, although it demonstrates lower market acceptance compared to the other alternatives.

3.1.2 Customer Review Sentiment Analysis Results

Customer review sentiment analysis was conducted by classifying reviews based on star ratings. Reviews with 4–5 stars were categorized as positive sentiment, 3-star reviews as neutral sentiment, and 1–2 star reviews as negative sentiment. The percentage of each sentiment category was calculated based on the total number of reviews for each product.

Table 5. Sentiment Distribution Based on Star Ratings

Product	Total Reviews	Positive (%)	Neutral (%)	Negative (%)
Mangoman	642	94.7	3.0	2.3
MAIMEITE	14,400	95.1	2.9	1.8
SCUDOS	180	97.8	1.1	1.1

Table 5 shows that positive sentiment dominates all evaluated products, indicating a high level of customer satisfaction. SCUDOS records the highest percentage of positive sentiment, while MAIMEITE maintains stable sentiment across a very large number of reviews, demonstrating consistent product performance.

3.1.3 Criteria Weighting Results Using the Analytic Hierarchy Process (AHP)

Criteria weighting was conducted using the Analytic Hierarchy Process (AHP) to determine the relative importance of the evaluation criteria used in assessing automatic curling iron products. Five criteria were considered: product rating, number of reviews, star-based sentiment, sales volume, and product price.

It is acknowledged that product rating, number of reviews, and star-based sentiment are all derived from customer review data and may therefore exhibit a certain degree of correlation. However, in this study, these criteria were deliberately retained as separate dimensions because each represents a distinct conceptual aspect of consumer evaluation and serves a different analytical purpose.

Product rating reflects the overall perceived quality of a product based on average customer evaluations. Number of reviews represents the level of consumer participation and market exposure, indicating how widely a product has been adopted and discussed. Star-based sentiment captures the distribution of customer satisfaction, revealing whether evaluations are predominantly positive, balanced, or polarized, which cannot be fully represented by average rating values alone.

By decomposing review-related information into these three complementary criteria, the analysis avoids over-reliance on a single aggregated indicator and enables a more comprehensive assessment of customer perception. This approach has been commonly adopted in multi-criteria decision-making studies involving e-commerce and online review data.

Sales volume and product price were included as independent criteria to represent market acceptance and economic considerations, respectively, and are not derived from customer review information.
The criteria weights obtained from the AHP calculation are presented in Table 6.

Table 6. AHP Criteria Weights

Criteria	Weight
Product Rating	0.202
Number of Reviews	0.202
Star-Based Sentiment	0.089
Sales Volume	0.465
Product Price	0.043
Total	1.000

The results show that sales volume has the highest weight, indicating that market acceptance plays a dominant role in product evaluation. Product rating and number of reviews receive equal weights, highlighting the importance of both perceived quality and consumer engagement. Although star-based sentiment originates from the same review source, it contributes additional insight into satisfaction distribution and therefore receives a separate, lower weight. Product price has the lowest weight, suggesting that consumers prioritize performance and popularity over price differences in this product category.

Although product rating, number of reviews, and star-based sentiment are derived from customer review data, each criterion represents a distinct aspect of consumer evaluation. Product rating reflects perceived product quality, number of reviews indicates the level of customer engagement, while star-based sentiment captures the emotional polarity of customer opinions. The application of AHP weighting further mitigates potential redundancy by assigning relative importance based on each criterion's overall contribution to the decision-making process.

3.1.4 Consistency Test Results

A consistency test was conducted to ensure that the pairwise comparison matrix was logically consistent. In AHP, this test is based on the calculation of the maximum eigenvalue (λ_{max}), which is a numerical result derived from the pairwise comparison matrix and the criteria weight vector.

Based on the calculation, the maximum eigenvalue (λ_{max}) obtained in this study was 5.114. Given that the number of criteria (n) was 5, the Consistency Index (CI) was calculated as:

$$CI = \frac{\lambda_{max} - n}{n - 1}$$

$$CI = \frac{5.114 - 5}{5 - 1} = 0.0285$$

The CI value was then compared with the Random Index (RI) value of 1.12 for a matrix of order five to calculate the Consistency Ratio (CR):

$$CR = \frac{CI}{RI}$$

$$CR = \frac{0.0285}{1.12} = 0.0286$$

Since the CR value is less than or equal to 0.10, the pairwise comparison matrix is considered consistent, and the derived criteria weights are valid for further analysis.

3.1.5 Normalization Results of Alternative Products

Normalization was applied to standardize the performance values of each alternative across all evaluation criteria, enabling fair comparison among criteria measured using different units and scales within the Analytic Hierarchy Process (AHP) framework. This step prevents any criterion from disproportionately influencing the final decision due to scale differences.

For benefit-type criteria, namely Product Rating, Number of Reviews, Star-Based Sentiment, and Sales Volume, normalization was performed using methods appropriate to the data characteristics. Product Rating, Number of Reviews, and Star-Based Sentiment were normalized using max normalization, where each value was divided by the maximum value within the same criterion to represent relative performance.

Sales Volume was normalized using a proportional sum method, in which each product's sales value was divided by the total sales of all alternatives. This method reflects each product's relative contribution to overall market performance and avoids bias caused by extreme values.

For the cost-type criterion (Product Price), inverse normalization was applied to ensure that lower prices receive higher preference values, consistent with the decision-making objective.

The normalization results show that MAIMEITE dominates the Number of Reviews and Sales Volume criteria, indicating strong market acceptance and consumer engagement. SCUDOS performs best in Product Rating and Star-Based Sentiment, reflecting high customer satisfaction. Meanwhile, Mangoman achieves the highest normalized score for Product Price, demonstrating a competitive cost advantage.

These normalized values represent relative performance and serve as input variables for calculating the final AHP scores, ensuring fairness, consistency, and reliability in the evaluation process.

In this study, sales volume was intentionally normalized using a proportional (sum-based) normalization approach rather than max normalization. This method was selected to represent each product's relative contribution to total market demand, ensuring that alternatives with extremely large sales values do not disproportionately dominate the evaluation results. By applying proportional normalization, differences in sales volume remain reflected in the analysis while maintaining comparability and balance with other criteria measured on different scales. This approach enhances the robustness and interpretability of the final AHP scores.

Table 7 presents the normalized performance values of each alternative.

Table 7. Normalized Alternative Matrix

Alternative	Rating	Reviews	Sentiment	Sales Volume	Price
Mangoman	0.3310	0.0422	0.3294	0.2466	0.4556
MAIMEITE	0.3310	0.9459	0.3307	0.4558	0.2465
SCUDOS	0.3379	0.0118	0.3400	0.3767	0.2980

3.1.6 Final AHP Scores and Product Ranking

The final AHP scores were obtained by integrating the criteria weights derived from the Analytic Hierarchy Process (AHP) with the normalized values of each alternative. This step aims to determine the overall performance score of each product by simultaneously considering the relative importance of evaluation criteria and the performance of each product on those criteria.

The calculation of the final AHP score was performed using a weighted sum approach. Each normalized criterion value was multiplied by its corresponding criterion weight, and the results were then summed to obtain the final score for each alternative. The calculation is expressed as follows:

$$Si = \sum_{j=1}^{n} w_j \times a_{ij}$$

Where Si represents the final AHP score of alternative i, w_j denotes the weight of criterion j, a_{ij} is the normalized value of alternative i for criterion j and n indicates the total number of criteria.

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Based on the criteria weights presented in Section 3.1.3 and the normalized alternative matrix in Section 3.1.5, the final AHP scores for each product were calculated. The normalized values of alternatives and the corresponding criteria weights are summarized in Tables 6 and 7.

$$\text{Normalized Value of Alternative}\begin{bmatrix}\text{Mangoman}\\ \text{MAIMEITE}\\ \text{SCUDOS}\end{bmatrix}=\begin{bmatrix}0{,}3310 & 0{,}0422 & 0{,}3294 & 0{,}2466 & 0{,}4556\\ 0{,}3310 & 0{,}9459 & 0{,}3307 & 0{,}4558 & 0{,}2465\\ 0{,}3379 & 0{,}0118 & 0{,}3400 & 0{,}3767 & 0{,}2980\end{bmatrix}$$

$$\text{The Weight of Criterion}\begin{bmatrix}\text{Produk Rating}\\ \text{Number of Reviews}\\ \text{Star}-\text{Based Sentiment}\\ \text{Sales Volume}\\ \text{Product Price}\end{bmatrix}=\begin{bmatrix}0{,}202\\ 0{,}202\\ 0{,}089\\ 0{,}465\\ 0{,}043\end{bmatrix}$$

$$\begin{bmatrix}0{,}3310 & 0{,}0422 & 0{,}3294 & 0{,}2466 & 0{,}4556\\ 0{,}3310 & 0{,}9459 & 0{,}3307 & 0{,}4558 & 0{,}2465\\ 0{,}3379 & 0{,}0118 & 0{,}3400 & 0{,}3767 & 0{,}2980\end{bmatrix}\times\begin{bmatrix}0{,}202\\ 0{,}202\\ 0{,}089\\ 0{,}465\\ 0{,}043\end{bmatrix}$$

$$=\begin{bmatrix}0{,}2390\\ 0{,}5099\\ 0{,}2889\end{bmatrix}$$

The calculation results indicate that MAIMEITE obtained the highest final AHP score. This result is primarily influenced by its strong performance on criteria with the highest weights, particularly sales volume and number of reviews. In contrast, SCUDOS demonstrated excellent performance in product rating and sentiment; however, its relatively lower sales volume reduced its overall score. Meanwhile, Mangoman benefited from a competitive price, which contributed positively to its final score despite lower performance in other criteria.

To facilitate interpretation and comparison, the final AHP scores were converted into percentage values and ranked accordingly. The ranking results are presented in Table 8.

Table 8. Product Ranking Based on Final AHP Scores

Product	Final AHP Score	Percentage %	Rank
MAIMEITE	0.5099	50.99%	1
SCUDOS	0.2889	28.89%	2
Mangoman	0.2390	23.90%	3

As shown in Table 8, MAIMEITE ranks first, followed by SCUDOS and Mangoman. This ranking demonstrates that products performing well on highly weighted criteria tend to achieve higher overall scores, even if they are less competitive on other criteria.

The final product ranking is further illustrated in Figure 3, which visually compares the final AHP scores of each product and highlights the differences in overall performance.

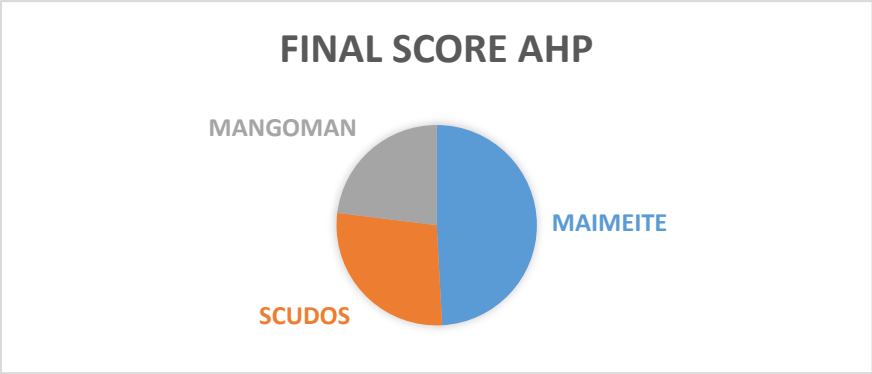

Fig 3. Product Ranking Based on Final AHP Scores

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3.2 Discussion

The results of this study indicate that customer evaluation and market acceptance play a crucial role in determining the final ranking of automatic hair curler products. Although all evaluated products exhibit high customer satisfaction based on rating and sentiment analysis, differences in sales volume and customer engagement significantly influence the final decision-making outcomes.

The sentiment analysis results reveal that positive sentiment dominates all products, suggesting that the overall quality of the evaluated products is well accepted by consumers. However, sentiment alone is not sufficient to determine the best product, as products with excellent customer perception may still obtain lower final scores if they perform weakly on highly weighted criteria. This finding highlights the importance of integrating qualitative customer perception with quantitative performance indicators.

The AHP weighting results show that sales volume has the highest influence on the final decision. This indicates that products with higher market penetration and purchasing frequency tend to be perceived as more reliable and trustworthy by consumers. As a result, products that perform strongly in sales volume and number of reviews gain a significant advantage in the final evaluation, even when price differences exist.

The final product ranking demonstrates that MAIMEITE achieves the highest overall score due to its consistent performance across the most influential criteria, particularly sales volume and number of reviews. SCUDOS ranks second, supported by its superior product rating and positive sentiment, although its lower sales volume limits its overall score. Mangoman ranks third, benefiting from a competitive price but showing weaker performance in market acceptance-related criteria.

Overall, the integration of the Analytic Hierarchy Process (AHP) and customer review sentiment analysis provides a comprehensive and objective approach to product evaluation in e-commerce environments. This approach enables decision-makers to consider both consumer perception and market performance, resulting in more reliable and transparent product selection outcomes.

4. Conclusion

This study successfully applied the Analytic Hierarchy Process (AHP) combined with customer review sentiment analysis to evaluate and rank automatic hair curler products in an e-commerce environment. The results demonstrate that criteria related to market acceptance, particularly sales volume and number of reviews, have the most significant influence on the final product ranking, while product rating, sentiment, and price play supporting roles.

The final AHP scores indicate that MAIMEITE achieves the highest overall performance, followed by SCUDOS in second place and Mangoman in third place. MAIMEITE's superior ranking is driven by its strong and consistent performance on highly weighted criteria, especially sales volume and customer engagement.

The integration of quantitative decision-making methods with customer perception analysis provides a transparent and objective evaluation framework that can support consumers in making informed purchasing decisions and assist sellers in improving product competitiveness. Future studies may expand the number of alternatives, incorporate additional criteria, or apply advanced sentiment analysis techniques to further enhance the robustness of product evaluation on e-commerce platforms.

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