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# Comparative Analysis of Packaging Supplier Performance Using AHP-SAW and AHP-WP Approaches

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## *ABSTRAK*

This study aims to evaluate the performance of packaging suppliers used by Nasi Tempong Nyonya as a crucial component of operational effectiveness in the fast-food industry. Packaging suppliers play a strategic role in supporting daily operations, as packaging quality directly affects food safety, product presentation, brand image, and overall customer satisfaction. Therefore, systematic supplier evaluation is required to ensure consistent material quality, price stability, timely delivery, and reliability of supply in meeting operational demands. Preliminary observations reveal several challenges in the procurement of packaging materials, including frequent price fluctuations, inconsistent material quality, limited use of environmentally friendly packaging, and suboptimal supplier responsiveness to sudden changes in demand volume. These issues have the potential to disrupt operational workflows and reduce service consistency. To address these concerns, this research adopts an evaluative approach by analyzing key supplier performance indicators, direct operational observations, and assessments aligned with the company's operational needs and standards. The findings indicate that the current packaging supplier has not fully met Nasi Tempong Nyonya's operational expectations, particularly in terms of material quality consistency and delivery timeliness. These shortcomings highlight the importance of implementing a more structured and objective supplier evaluation system. Such a system can serve as a strategic basis for performance improvement initiatives, strengthening long-term supplier relationships, or considering alternative suppliers. Ultimately, this study is expected to provide practical insights to enhance operational efficiency and maintain consistent service quality for customers.

**Keywords:** supplier evaluation, packaging performance, fast-food operations, supply chain management, material quality

## INTRODUCTION

Role in determining material quality, cost efficiency, and smooth production processes. Supplier evaluation has also proven crucial for maintaining supply stability and mitigating operational risks such as delivery delays, price fluctuations, and inconsistent product quality (Wahyudi, 2025). In increasingly dynamic and competitive markets, companies need to implement systematic and measurable supplier evaluation mechanisms to improve operational effectiveness (Abror et al., 2012). Without a structured evaluation process, companies potentially experience wasted resources and disrupted production flows, ultimately impacting customer satisfaction (Iskandar & Pungkasara, n.d.) . In the food industry, the need for supplier evaluation is increasingly crucial given stringent food safety and quality standards. Packaging not only serves as product protection but also plays a role in maintaining food safety, maintaining quality during distribution, and supporting brand identity (Morashti et al., 2022). Furthermore, increasing consumer preference for environmentally friendly packaging encourages companies to choose suppliers capable of providing sustainable materials (Wahyuni et al., 2025). Thus, packaging suppliers play a crucial role in supporting operational continuity and maintaining product quality in the food business.

In the context of Nasi Tempong Nyonya, packaging suppliers directly influence service speed and product quality consistency. Initial observations indicate price instability, material quality fluctuations, and low levels of material sustainability, late deliveries, and suppliers' lack of adaptive response to changing demand. These conditions indicate that supplier performance is not fully meeting operational needs and has the potential to impact service quality and customer satisfaction. Previous research on supplier evaluation has shown that the Multi-Criteria Decision Making (MCDM) method is widely used to assess supplier performance across various aspect (Habsari et al., 2022). Applied the Analytical Hierarchy Process (AHP) to select packaging suppliers based on the criteria of price, quality, delivery time, and service. This study demonstrated that the AHP approach is effective in assigning priority weights to determine the supplier most suited to the packaging industry's needs. Meanwhile, (Wijaya & Widodo, 2023) expanded the MCDM approach through Fuzzy AHP in the supplier evaluation process in the food industry, considering more complex criteria such as quality, cost, service, delivery, halal aspects, and environmental aspects. This approach emphasizes the importance of non-technical variables in strategic supplier decision-making. Meanwhile, (Abror et al., 2012) used a combination of Fuzzy AHP and TOPSIS to evaluate kraft paper suppliers by integrating sustainability aspects. These findings reinforce the view that environmental dimensions are becoming increasingly relevant in selecting packaging material suppliers.

Based on these conditions, this study aims to evaluate the performance of packaging suppliers at Nasi Tempong Nyonya using six main criteria: material quality, delivery time, price stability, supply consistency, response time, and environmental friendliness. The research results are expected to provide a stronger basis for companies in formulating supplier management policies, improving procurement effectiveness, and selecting suppliers capable of sustainably meeting operational needs.

## METHODS

Supplier selection is a critical managerial decision for culinary small and medium enterprises (SMEs), particularly those that rely heavily on packaging materials to maintain food quality, safety, and brand consistency. For a culinary SME such as Nasi Tempong Nyonya, plastic packaging suppliers play a strategic role because packaging directly affects hygiene standards, customer perception, operational efficiency, and cost control. Selecting the most appropriate supplier is not a simple decision, as it involves multiple criteria that are often conflicting, such as price competitiveness, product quality, delivery reliability, availability of stock, and responsiveness of service. Therefore, a structured and quantitative decision-making approach is required to reduce subjectivity and improve decision accuracy. The methodological framework illustrated in the diagram integrates three multi-criteria decision-making (MCDM) methods, namely the Analytical Hierarchy Process (AHP), Simple Additive Weighting (SAW), and Weighted Product (WP). This hybrid approach is designed to combine the strengths of each method in order to produce a more robust and reliable supplier evaluation outcome. AHP is used to determine the relative importance of each evaluation criterion, while SAW and WP are applied to rank supplier alternatives based on different mathematical aggregation principles. The final decision is obtained by comparing the results of these methods and identifying the supplier that demonstrates consistent superiority.

### Multi-Attribute Decision Making

This study employs a Multi-Attribute Decision Making (MADM) approach by applying the AHP-SAW and AHP-WP comparison methods. Multi-Attribute Decision Making (MADM) is a decision-making framework used to select the best alternative from several options based on multiple, often conflicting, attributes or criteria (Yoon & Hwang, 1995). The combination of these methods was selected to evaluate and determine the most suitable packaging supplier for Nasi Tempong Nyonya based on predefined supplier performance criteria. The AHP method is utilized to generate objective criterion weights through pairwise comparisons and consistency testing, while the Simple Additive Weighted (SAW) and WP methods are employed to rank supplier alternatives quantitatively.

### Research Location and Object

The study was conducted at the culinary MSME Nasi Tempong Nyonya, located in Lebak Regency. The research object is the evaluation process of packaging suppliers used in the business's operational activities. The three suppliers assessed in this study are:

1. Mitra Plastik Serpong
2. Mulia Plastik
3. Toko Plastik Sejahtera

The evaluation focuses on suppliers of plastic wrap, food boxes, and plastic bags used in the daily operations of the business.

### Data Collection Methods

Supplier performance is assessed based on six criteria relevant to the procurement of packaging for Nasi Tempong Nyonya, namely:

1. Material Quality, evaluating the durability and safety of packaging materials.
2. Delivery Time, measuring the supplier's punctuality in delivering orders.
3. Price Stability, assessing price fluctuations and consistency over time.
4. Supply Consistency, evaluating the reliability of maintaining product availability.
5. Time Response, measuring the speed and effectiveness of communication, and problem resolution.
6. Environmental, assessing sustainability aspects such as recyclability or eco-friendly material characteristics.

These six criteria serve as the basis for the weighting process in AHP and the evaluation stages in Simple Additive Weighted (SAW) and Weighted Product (WP).

### Flowchart Diagram of Method

The flowchart (see Fig. 1) illustrates the data processing steps for decision-making, beginning with determining the criterion weights using the Analytic Hierarchy Process (AHP), which must meet the required consistency level (CR < 0.1) through pairwise comparison. Once consistency is achieved, the process continues with the performance comparison of alternatives using two parallel Multi-Criteria Decision Making (MCDM) methods: Simple Additive Weighting (SAW) and Weighted Product (WP). Both methods include normalization procedures followed by the ranking of alternatives.

The ranking results and preference values obtained from Simple Additive Weighted (SAW) and Weighted Product (WP) are then compared to evaluating accuracy and identifying the most optimal combination of methods or "The Best Methods" that can be applied.

### Analytic Hierarchy Process (AHP)

The Analytic Hierarchy Process (AHP) is a decision-making method that decomposes complex problems into a hierarchical structure and performs pairwise comparisons to determine the priority of each decision element (Hillier & Price, n.d.). In this study, AHP is used to determine the priority weights of each criterion. The steps involved are as follows:

1. Pairwise Comparison Matrix

A pairwise comparison matrix is constructed based on the owner's assessments, using Saaty's 1-9 scale to determine the relative importance of each criterion.

**Table 1. Saaty Scale**

| Intensity of Importance | Definition |
|---|---|
| 1 | Equal Importance |
| 3 | Moderate Importance |
| 5 | Strong Importance |
| 7 | Very Strong Importance |
| 9 | Extreme Importance |
| 2,4,6,8 | The values between the two adjacent judgements |

Source: Saaty Scale (1980)

2. Normalization and Priority Vector

The matrix is normalized by dividing each cell value by the total value of its respective column. The priority weights for each criterion are then calculated by averaging the normalized values in each row.

3. Consistency Test

The consistency ratio (CR) is calculated using λmax, the consistency index (CI), and the consistency ratio (CR). A CR value ≤ 0.10 indicates an acceptable level of consistency. If the CR exceeds this threshold, respondents are required to revise their pairwise comparison judgments.

Description:

Max: Eigen value maximum
CI: consistency index
CR: consistency ratio
IR: index random

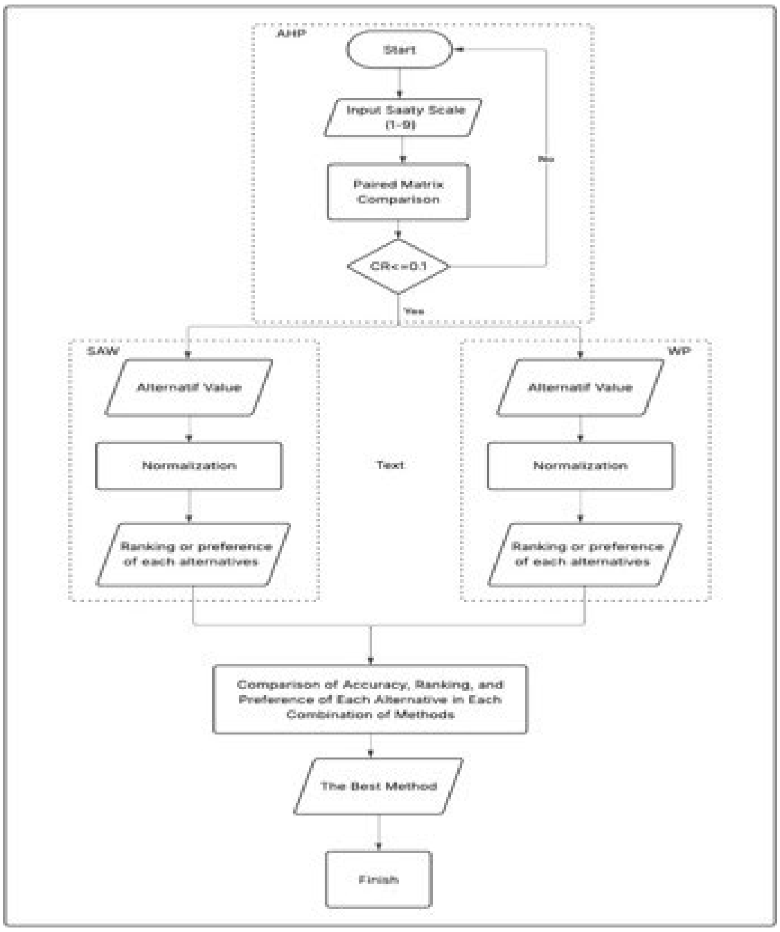


**Figure 1. Process Flow Diagram of Combined AHP-SAW and AHP-WP Methods**

Source: Data Analysis Research, 2025

## Simple Additive Weighting (SAW)

Simple Additive Weighting (SAW) method is a multi-criteria decision-making technique that evaluates and ranks alternatives by summing the normalized performance values of each criterion multiplied by their corresponding weights, where the alternative with the highest overall score is considered the most preferred option (Triantaphyllou, 2000). The Simple Additive Weighted (SAW) method is applied to obtain the performance scores of each supplier. The procedure includes the following steps:

1. Preparing the decision matrix based on supplier performance for each criterion.
2. Normalizing the matrix using appropriate normalization formulas:

   Benefit criteria: $r_{ij} = \frac{X_{ij}}{Max \quad X_j}$ (1)

   Cost criteria: $r_{ij} = \frac{Min \ X_j}{X_{ij}}$ (2)

   Description:
   $rij$ : normalized performance rating
   $max \ xij$ : the highest value of each row and column
   $min \ xij$ : the lowest value of each row and column
   $xij$ : row, and column of the matrix
3. Calculate the preference score for each alternative.

   $$V_i = \sum_{j=1}^{n} w_j \, . \, r_{ij}$$ (3)

   Description:
   $V_i V_i$ : The final preference score for ranking. A higher value indicates a better rank.
   $W_j W_j$ : The weight of importance the criterion, determined by the decision-maker, where the sum of weights equals 1.
   $r_{ij}$ : The normalised matrix value was calculated in the previous step.
   A larger $Vi$ value indicates that alternative $Ai$ is preferred
4. Ranking the suppliers based on their final scores.

## Weight Product (WP)

Weighted Product (WP) method is a multi-attribute decision-making approach in which the preference of each alternative is determined through a multiplicative aggregation of criterion performance values, where each criterion value is raised to the power of its assigned weight to reflect its relative importance (Hwang & Yoon, 1981). The Weighted Product (WP) method is used as a comparative ranking approach. The steps include:

1. Developing the decision matrix for all criteria.
2. Normalizing the criterion weights.

   $W_j = \frac{W_j}{\sum W_j}$ (4)
3. Calculate the preference vector.

   $$S_i = \prod_{j=1}^{n} x_{ij}^{w_j}$$ (5)

$S_i S_i$(Vector S: The intermediate preference score for alternative.

$\Pi\Pi$ (Product Operator): Indicates that all values are multiplied, which creates a "veto" effect; if one criterion is zero or very low, the total score drops significantly.

$w_j w_j$(Power Weight):

- If the criterion is benefit, $w_j w_j$ is positive $(+w+w)$.
- If the criterion is cost, $w_j w_j$ is negative $(-w-w)$ to mathematically penalise higher values (since $x^{-w} = {}^{1}/_{x^w}$ $x^{-w} = {}^{1}/_{x^w}$).

4. Determining the final relative preference values.

$$V_i = \frac{S_i}{\sum_{i-1}^{m} S_i} \tag{6}$$

$V_i$: The final relative preference value for alternative, used for ranking.

$S_i$: The vector S value of the alternative.

$\sum S_i$: The summation of all vector S values for all candidates.

5. Ranking the suppliers based on the highest preference value.

## RESULTS

### The Weighting Process with AHP Method

Before conducting the multi-criteria decision analysis, it is essential to define and quantify the performance of each supplier alternative across the selected evaluation criteria. This stage aims to translate qualitative observations and operational experiences into measurable numerical values that can be processed using decision-support methods. In this study, three plastic packaging suppliers such as Mitra Plastik Serpong, Mulia Plastik, and Toko Plastik Sejahtera were evaluated based on six key criteria considered relevant to the operational needs of the culinary Nasi Tempong Nyonya. These criteria include material quality (1), delivery time (2), price stability (3), supply consistency (4), response time (5), and environmental protection (6).

**Table 2. Alternative Data**

| Supplier | Material Quality | Delivery Time (Hour) | Price Stability | Supply Consistency | Response Time (Hour) | Environmental |
|---|---|---|---|---|---|---|
| Mitra Plastik Serpong (A1) | 8 | 8 | 9 | 8 | <1 | 7 |
| Mulia Plastik (A2) | 7 | 9 | 7 | 6 | 1-2 | 5 |
| Toko Plastik Sejahtera (A3) | 6 | 13 | 6 | 7 | >3 | 4 |

Source: Data processed by the author, 2025

**Tabel 3. Pairwaise Comparison**

| Criteria | Material Quality | Delivery Time | Price Stability | Supply Consistency | Response Time | Environmental | Eigen Value | Priority Weight |
|---|---|---|---|---|---|---|---|---|
| Material Quality | 1.00 | 3.00 | 3.00 | 3.00 | 3.00 | 2.00 | 2.33 | 0.34 |
| Delivery Time | 0.33 | 1.00 | 5.00 | 1.00 | 5.00 | 3.00 | 1.71 | 0.25 |
| Price Stability | 0.33 | 0.20 | 1.00 | 3.00 | 0.20 | 3.00 | 0.70 | 0.10 |
| Supply Consistency | 0.33 | 1.00 | 0.33 | 1.00 | 2.00 | 3.00 | 0.93 | 0.14 |
| Response Time | 0.33 | 0.20 | 5.00 | 0.50 | 1.00 | 0.33 | 0.62 | 0.09 |
| Environmental | | | | | | | | |

| Criteria | Material Quality | Delivery Time | Price Stability | Supply Consistency | Response Time | Environmental | Eigen Value | Priority Weight |
|---|---|---|---|---|---|---|---|---|
| Protection | 0.50 | 0.33 | 0.33 | 0.33 | 3.00 | 1.00 | 0.62 | 0.09 |
| Total Quantity | 2.83 | 5.73 | 14.67 | 8.83 | 14.20 | 12.33 | 6.92 | 1.00 |

Source: Data processed by the author, 2025

Table 3 shows that Material Quality is the most influential criterion with a priority weight of 0.34, followed by Delivery Time at 0.25. This indicates that material quality and timely delivery are the primary considerations in the decision-making process. Furthermore, Supply Consistency has a weight of 0.14, suggesting that continuity of supply is prioritized over price-related factors. Price Stability accounts for 0.10, while Response Time and Environmental Protection each have a weight of 0.09, indicating that these criteria serve as supporting factors rather than key determinants. Overall, the results demonstrate that quality and operational performance play a more significant role than cost and environmental aspects in establishing decision priorities.

**Tabel 4. AHP Consistency Test Results**

| λ maks(lamda maks) | CI (konsistensi Index) | IR (Index Ratio) | CR (Consistency Ratio) |
|---|---|---|---|
| 6.439 | 0.0878 | 1.24 | 0.0708 |

Source: Data processed by the author, 2025

The calculation yielded a Consistency Ratio CR of 0.0708. According to Saaty's theory, a CR value less than 0.1 (or 10%) indicates that the pairwise comparison matrix has an acceptable level of consistency. This signifies that the subjective judgments made regarding the criteria are logically consistent and valid for decision-making. Consequently, the derived priority weights can be reliably used for the subsequent ranking processes in Simple Additive Weighted (SAW) and Weighted Product (WP) methods.

## AHP-SAW Method

The resulting pairwise comparison matrix forms the basis for calculating eigenvalues and priority weights for each criterion. These weights represent the contribution of each criterion to the overall decision-making process and are subsequently used in the SAW and WP methods to compute supplier preference scores. By separating the weighting phase from the alternative evaluation phase, the model ensures that the ranking of suppliers is grounded in both rational priority setting and objective performance assessment. Based of each criteria, this is the type of benefit and cost of each criteria.

**Table 5. Criteria and Type**

| No | Material Quality |
|---|---|
| Material Quality | Benefit |
| Delivery Time | Cost |
| Price Stability | Benefit |
| Supply Consistency | Benefit |
| Response Time | Cost |
| Environmental Protection | Benefit |

Source: Data processed by the author, 2025

Based on these formulas, the normalized matrix was obtained as follows:

**Tabel 6. Normalization Results**

| Supplier | Material Quality | Delivery Time | Price Stability | Supply Consistency | Response Time | Environmental |
|---|---|---|---|---|---|---|
| Mitra Plastik Serpong (A1) | 1.000 | 0.714 | 1.000 | 1.000 | 0.556 | 1.000 |
| Mulia Plastik (A2) | 0.875 | 1.000 | 0.778 | 0.750 | 0.625 | 0.714 |
| Toko Plastik Sejahtera (A3) | 0.750 | 0.833 | 0.667 | 0.875 | 1.000 | 0.571 |

Source: Data processed by the author, 2025

### Final Preference Value Calculation

The following section presents the detailed calculation of the final preference value of one supplier for Mitra Plastik Serpong (A1) using this vector calculation ($V_i$):

$$V_i = \frac{S_i}{\sum_{i-1}^{m} S_i}$$

$$V_{A1} = (0.34 \times 1.00) + (0.25 \times 1.00) + (0.10 \times 1.00) + (0.14 \times 1.00) + (0.09 \times 1.00) + (0.09 \times 1.00)$$
$$V_{A1} = 0.34 + 0.25 + 0.10 + 0.14 + 0.09 + 0.09 = 0.890$$

**Tabel 7. Vector Result of SAW**

| Supplier | Material Quality | Delivery Time | Price Stability | Supply Consistency | Response Time | Environmental | Total |
|---|---|---|---|---|---|---|---|
| Mitra Plastik Serpong (A1) | 0.338 | 0.177 | 0.102 | 0.135 | 0.050 | 0.089 | 0.890 |
| Mulia Plastik (A2) | 0.295 | 0.247 | 0.079 | 0.101 | 0.056 | 0.064 | 0.842 |
| Toko Plastik Sejahtera (A3) | 0.253 | 0.206 | 0.068 | 0.118 | 0.089 | 0.051 | 0.785 |

Source: Data processed by the author, 2025

The rangking of AHP – SAW results for the other suppliers were obtained:

**Table 8. Rangking of AHP- SAW**

| Ranking | Supplier | Score |
|---|---|---|
| 1 | Mitra Plastik Serpong (A1) | 0.890 |
| 2 | Mulia Plastik (A2) | 0.842 |
| 3 | Toko Plastik Sejahtera (A3) | 0.785 |

Source: Data processed by the author, 2025

### AHP-WP Method

The Weighted Product (WP) method uses multiplication to connect attribute ratings, where the rating of each attribute is raised to the power of its respective attribute weight $w_j$. The following section presents the detailed calculation of the final preference value of one supplier for Mitra Plastik Serpong (A1) using this vector calculation ($S_i$).

$$S_i = \prod_{j=1}^{n} x_{ij}^{w_j}$$

Here, actual calculation for Mitra Plastik Serpong (A1):

$$S_{A1} = (8^{0.34}) \times (7^{-0.25}) \times (9^{0.10}) \times (8^{0.14}) \times (1^{-0.09}) \times (7^{0.09})$$
$$S_{A1} = (2.02) \times (0.61) \times (1.25) \times (1.33) \times (1.00) \times (1.19) = 2.056$$

Here, all the S vector calculation:

Tabel 9. S Vector Calculation

| Supplier | Material Quality | Delivery Time | Price Stability | Supply Consistency | Response Time | Environmental | Total |
|---|---|---|---|---|---|---|---|
| Mitra Plastik Serpong (A1) | 2.018 | 0.618 | 1.250 | 1.324 | 0.822 | 1.190 | 2.019 |
| Mulia Plastik (A2) | 1.929 | 0.672 | 1.218 | 1.274 | 0.831 | 1.155 | 1.928 |
| Toko Plastik Sejahtera (A3) | 1.831 | 0.642 | 1.200 | 1.301 | 0.866 | 1.132 | 1.798 |

Source: Data processed by the author, 2025

And then, determining the final relative preference values using this calculation:

$$V_i = \frac{S_i}{\sum_{i-1}^{m} S_i}$$

The relative preference value ($V_i$) is calculated by normalizing the ($S_i$) value by using the total $S_i$ is 5.745. Here, the calculation vector preference for Mitra Plastik Serpong (A1):

$$V_{A1} = \frac{2.019}{5.745} = 0.351$$

Here, the final ranking result of AHP-WP method.

Table 10. Rangking of AHP- WP

| Ranking | Supplier | Score |
|---|---|---|
| 1 | Mitra Plastik Serpong (A1) | 0.351 |
| 2 | Mulia Plastik (A2) | 0.336 |
| 3 | Toko Plastik Sejahtera (A3) | 0.313 |

Source: Data processed by the author, 2025

Based on the Table.10, Mitra Plastik Serpong (A1) ranks first with the highest score of 0.351, indicating the best overall performance according to the weighted evaluation of all criteria. Mulia Plastik (A2) follows closely in second place with a score of 0.336, showing that its performance is competitive and only slightly below A1, making it a viable alternative supplier. Toko Plastik Sejahtera (A3) ranks third with a score of 0.313, suggesting relatively lower performance compared to the other suppliers. Overall, the small differences in scores indicate a high level of competition among suppliers, although A1 remains the most recommended option based on the AHP–WP results.

## DISCUSSIONS

The results of this study demonstrate that the integration of the Analytical Hierarchy Process (AHP) with the Simple Additive Weighting (SAW) and Weighted Product (WP) methods provides a robust and reliable framework for supplier selection in culinary small and medium enterprises (SMEs). The comparative analysis shows that both AHP–SAW and AHP–WP produce an identical ranking order of packaging suppliers, with Mitra Plastik Serpong (A1) consistently ranked as the most preferred supplier, followed by Mulia Plastik (A2) and Toko Plastik Sejahtera (A3). This convergence of results is a critical finding, as it indicates that the decision outcome is stable and not sensitive to the choice of ranking method. In multi-criteria decision-making (MCDM) research, consistency across different evaluation methods is often interpreted as a sign of decision robustness and methodological validity (Triantaphyllou, 2000). In this case, Mitra Plastik Serpong demonstrates superior performance across the most influential criteria identified in the AHP weighting process, particularly material quality and delivery time.

Packaging quality is directly linked to food safety, hygiene compliance, and customer perception, all of which are essential for maintaining brand trust and regulatory compliance (Kumar & Rahman, 2016). Poor-quality packaging materials may lead to contamination risks, reduced shelf life, and negative customer experiences, ultimately affecting business sustainability. Therefore, the strong emphasis on material quality observed in this study is consistent with prior research highlighting quality as a dominant criterion in supplier selection for the food and beverage sector (Govindan et al., 2015). Delivery time, which emerged as the second most influential criterion, further underscores the importance of operational reliability in SME supply chains. Culinary SMEs typically operate with limited inventory buffers and rely on frequent replenishment cycles. Delays in packaging supply can disrupt daily production activities and lead to service failures. Previous studies have emphasized that timely delivery is a critical determinant of supplier performance, particularly in time-sensitive industries such as food services (Ho et al., 2010). The strong performance of Mitra Plastik Serpong in this criterion significantly contributes to its top ranking under both SAW and WP models.

Although both methods yield the same ranking order, the characteristics of their preference values differ substantially. The AHP–SAW method produces higher and more widely dispersed preference scores, reflecting its additive structure. In SAW, strong performance in high-weighted criteria can compensate for weaker performance in lower-weighted criteria, resulting in greater differentiation among alternatives (Hwang & Yoon, 1981).

In contrast, the AHP–WP method generates lower and more closely clustered preference values, reflecting its multiplicative aggregation mechanism. The WP method penalizes low performance in any criterion more severely, especially when the criterion has a high weight (Brans & Mareschal, 2005). This non-compensatory behavior makes WP more conservative and risk-sensitive, as it discourages the selection of alternatives that exhibit significant weaknesses in critical dimensions.

The evaluation nature of WP is particularly relevant in food-related supply chains, where failures in a single criterion such as material quality or delivery reliability can have disproportionate negative impacts. As noted by Govindan et al. (2013), supplier selection in food supply chains must prioritize risk reduction and reliability due to the potential consequences of supply disruptions or quality failures. By emphasizing balanced performance across all criteria, the WP method provides a valuable perspective for strategic sourcing decisions that prioritize long-term resilience over short-term gains.

The convergence of AHP–SAW and AHP–WP rankings reinforces the conclusion that Mitra Plastik Serpong (A1) is the most suitable packaging supplier for Nasi Tempong Nyonya. Beyond identifying the top-ranked supplier, the analysis also provides diagnostic insights into the relative strengths and weaknesses of the other alternatives. Mulia Plastik's (A2) second-place ranking suggests competitive performance, particularly in price stability, but indicates the need for improvement in delivery responsiveness and environmental practices. Toko Plastik Sejahtera (A3), while demonstrating acceptable supply consistency and response time, underperforms in material quality and environmental criteria, limiting its overall ranking. These insights have important managerial implications. Rather than serving solely as a selection tool, the integrated AHP–SAW–WP framework can function as a strategic supplier evaluation and development instrument. SMEs can use the results to engage suppliers in performance improvement initiatives, focusing on criteria with high weights and lower scores. Additionally, the framework supports the development of multi-sourcing strategies, allowing SMEs to designate primary and secondary suppliers to mitigate supply risks.

Overall, this study contributes to the literature on MCDM applications in SME supply chain management by demonstrating the complementary strengths of SAW and WP when integrated with AHP. The identical ranking outcomes across methods confirm decision robustness, while differences in preference value behavior provide deeper insights into risk sensitivity and trade-off mechanisms. For culinary SMEs operating in competitive and resource-constrained environments, such an integrated approach offers a practical and theoretically grounded decision-support tool that enhances supplier selection quality, operational resilience, and long-term sustainability.

## CONCLUSION

This study evaluated the performance of packaging suppliers for Nasi Tempong Nyonya using a combined AHP-SAW and AHP-WP approach based on six key criteria: material quality, delivery time, price stability, supply consistency, response time, and environmental friendliness. The AHP results indicate that material quality and delivery time are the most influential factors in supplier selection, reflecting the operational priorities of fast-food businesses that require reliable packaging to maintain product quality and service speed. The consistency ratio obtained confirms that the weighting process is valid and reliable for further analysis.

The application of both AHP-SAW and AHP-WP methods produced consistent ranking results, with Mitra Plastik Serpong emerging as the top-performing supplier, followed by Mulia Plastik and Toko Plastik Sejahtera. This consistency demonstrates that the decision outcome is robust and not significantly affected by the choice of ranking methods. The findings also reveal that Mitra Plastik Serpong performs strongly across the most critical criteria, particularly material quality, delivery reliability, and price stability, making it the most suitable supplier for the company's current operational needs.

Although both methods yielded the same ranking order, differences in preference value distribution highlight the methodological characteristics of each approach. The AHP-SAW method provides more flexible and easily interpretable results due to its additive structure, making it suitable for practical managerial decision-making. In contrast, the AHP-WP method applies a stricter evaluation through multiplicative aggregation, which emphasizes balanced performance across all criteria and penalizes low-performing attributes more heavily. Therefore, the combined use of these methods offers a comprehensive perspective for supplier evaluation.

Overall, this study contributes practically by providing Nasi Tempong Nyonya with a structured and objective framework for supplier performance evaluation, supporting better procurement decisions and operational efficiency. For future research, it is recommended to expand the number of suppliers and incorporate additional criteria such as risk management, long-term partnership potential, or cost-benefit analysis. Further studies may also integrate fuzzy-based or dynamic decision-making models to capture uncertainty and changes in supplier performance over time.

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