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AHP–SAW-Based Decision Support System for Culinary Tourism Restaurant Selection in Semarang City

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ABSTRACT

Semarang City boasts a diverse array of appealing culinary restaurants, yet both tourists and local residents frequently encounter difficulties in selecting dining establishments that best match their preferences, often diminishing their culinary tourism experience and leading to inefficient time usage. This research aims to develop a decision support model by implementing a combined approach of the Analytic Hierarchy Process (AHP) and Simple Additive Weighting (SAW) to streamline the restaurant selection process. AHP was selected for its capability to establish hierarchical criteria weights, while SAW offers an efficient method for ranking alternatives. The initial phase utilized AHP to determine the weights of six identified relevant primary criteria: Cleanliness, Location, Price, Ambiance, Taste, and Rating. Assessments for each of these criteria were gathered through surveys administered to 30 culinary enthusiasts in Semarang City. Subsequently, the second phase employed SAW to calculate the final scores for 10 culinary tourism restaurants in Semarang, evaluated through questionnaires by 10 different respondents. The calculation results placed Folkcafe at ALVA in the first rank (with a score of 0.8656), followed by Ikan Bakar Cianjur in the second rank (score of 0.8524), and Pelangi Cheese Chiffon Cake in the third rank (score of 0.8173). These findings unequivocally demonstrate the effectiveness of applying AHP and SAW for prioritizing culinary restaurants in Semarang, further supported by the valid consistency of the AHP criteria weights (CR = 0.0341). This study contributes to the DSS literature by combining AHP and SAW in the underexplored context of culinary tourism ranking. This model is expected to serve as a practical guide for visitors and a foundational basis for the development of digital recommendation systems within the culinary tourism sector.

Keywords: AHP; Culinary Tourism; Restaurant Selection; SAW; Semarang City

INTRODUCTION

Semarang City stands out as a prominent tourist destination, renowned for its rich culinary heritage, ranging from traditional lumpia and wingko babat to a variety of modern dishes available across numerous locations. The sheer abundance of dining options frequently poses a challenge for both tourists and local residents in identifying restaurants that best align with their individual preferences. This issue becomes increasingly complex as each individual possesses distinct criteria for selecting an eatery, such as food quality, price, location, or ambiance. While applications like Google Maps offer user ratings and reviews, these features often fall short in assisting systematic decision-making that considers multiple factors comprehensively.

This problem highlights a pressing need for a decision-making system capable of objectively processing numerous criteria. Multi-Criteria Decision Making (MCDM) methods have been widely employed to address similar problems across diverse domains. For instance, research by (Alwedyan, 2024) utilized AHP methods to identify the best restaurants based on costs, location, and traffic patterns and accessibility, respectively, while (Hanin & Adi, 2023) applied the SAW method to assist students in selecting cafes based on provided facilities, location, and ambiance. However, there remains a limited body of research specifically combining AHP and SAW methods within the context of restaurant selection in Semarang.

This study aims to develop a decision support system integrating AHP and SAW to assist users in selecting restaurants in Semarang, based on six primary criteria: cleanliness, location, price, ambiance, taste, and rating. The data utilized in this research was collected from respondent surveys conducted via Google Forms. By applying this combined methodology, the generated recommendations are expected to more accurately reflect real user preferences.

The primary contribution of this research lies in the integration of AHP and SAW methods within the context of local restaurant selection, coupled with the validation of recommendation outcomes against actual user preferences.

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Furthermore, this study paves the way for the potential development of web- or mobile-based applications that could serve as culinary tourism guides in Semarang. Thus, this study offers not only academic value but also practical solutions directly implementable to support the regional tourism sector.

Therefore, this study seeks to answer the following research question: How can a combined AHP and SAW model support the selection of culinary restaurants in Semarang based on multi-criteria user preferences?

LITERATURE REVIEW

As the theoretical foundation for this study, the following literature review comprehensively discusses the fundamental concepts of Decision Support Systems (DSS), the core principles of both the Analytic Hierarchy Process (AHP) and Simple Additive Weighting (SAW) methods, as well as their direct relevance to the context of culinary tourism restaurant selection.

Decision Support Systems (DSS)

A Decision Support System (DSS) is an interactive, flexible and adaptable for supporting the solution of a non-structured management problem for improved decision making (Sridevy et al., 2023). DSS are integral to various domains, including commerce, tourism, healthcare, and environmental management, where they serve as critical tools for analyzing complex data and enhancing decision-making processes. In commerce, DSS facilitates the prediction of consumer trends, the optimization of inventory systems and the personalization of customer interactions, which helps achieve competitive advantages (Souha et al., 2025).

In the context of culinary tourism, a DSS is crucial for overcoming the complexities faced by visitors and locals in selecting suitable restaurants from a myriad of options, by systematically processing multiple, often conflicting, criteria.

Analytic Hierarchy Process (AHP) Method

The Analytic Hierarchy Process (AHP) is a Multi Criteria Decision Making Approach (MCDM), used to get the right decision for the complex high-stake problems (Sharma et al., 2022). AHP enables decision-makers to structure complex problems into a hierarchy, comprising goals, criteria, sub-criteria, and alternatives. A key advantage of AHP lies in its ability to measure the relative preferences between hierarchical elements through pairwise comparison.

The AHP process involves several key stages: (1) Development of a hierarchy of interconnected decision elements that describe the problem; (2) Comparing pairs of decision elements, usually using a 1–9 comparison scale, to obtain input data; (3) Calculation of relative weightings of decision-making elements, most often using the method of characteristic values; and (4) Aggregation of relative weightings of decision elements in order to calculate the rating of alternative decision possibilities (Cetkovic et al., 2023).AHP has been widely applied in various contexts, such as supplier selection (Agraeni & Gustian, 2021) and performance appraisal (Mustaqim & Kanedi, 2024).

For this study, AHP is essential to objectively determine the hierarchical importance of diverse restaurant selection criteria, derived from user preferences, thereby providing a structured basis for decision-making that addresses the subjective nature of individual choices.

Simple Additive Weighting (SAW) Method

The Simple Additive Weighting (SAW) method, often referred to as the weighted sum method, is one of the simplest and most widely used multi-criteria decision-making (MCDM) approaches (Stanujkic et al., 2023). The fundamental principle of SAW involves finding the weighted sum of performance ratings for each alternative across all attributes. This method necessitates the normalization of the decision matrix into a uniform scale to prevent bias arising from differing units or measurement scales among criteria.

The stages in the SAW method include: (1) Prepare the Initial Matrix; (2) Normalizing the Value of Criteria; (3) Integrating the Values of the Criteria and Weights; and (4) Ranking the Alternatives to Choose the Best One (Taherdoost, 2023). SAW is frequently chosen due to its computational simplicity and ease of interpretation, making it highly suitable for decision-making problems involving numerous alternatives and criteria with clearly defined weights.

In the context of restaurant selection, SAW provides an efficient and transparent mechanism to rank a large number of alternatives based on their performance against the weighted criteria, ensuring objective final recommendations.

Combination of AHP and SAW Methods

The combination of AHP and SAW methods represents a popular approach within Decision Support Systems. AHP

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is highly effective in determining subjective and structured criteria weights while accounting for the consistency of decision-makers' preferences. The weights derived from AHP can then be utilized as input for the SAW method, which subsequently performs an objective evaluation and ranking of alternatives. This combination leverages the strengths of both methods: AHP for accurate and consistent weighting, and SAW for efficient ranking (Suartini et al., 2023). This hybrid approach has proven effective in various case studies, including the selection of superior cattle breeds (Pradana et al., 2024), the determination of waste recycling innovation creations (Safitri et al., 2024), and recommendation systems.

This study specifically employs this hybrid approach to capitalize on AHP's ability to capture complex, multi-layered preferences for criteria weights and SAW's straightforward, objective ranking capabilities, thereby creating a robust and comprehensive decision support solution for culinary restaurant selection in Semarang where such integrated approaches are underexplored.

Application of DSS in Culinary Tourism Restaurant Selection

The application of Decision Support Systems (DSS) within the tourism sector, particularly in culinary tourism, has demonstrated significant potential in facilitating decision-making processes. Restaurant selection involves numerous criteria that are often conflicting, such as price, food quality, ambiance, and location. Previous research has explored the use of DSS to assist tourists or consumers in making optimal decisions. For instance, (Purnama et al., 2025) utilized the Simple Additive Weighting (SAW) method for selecting the best culinary establishments, while (Permatasari et al., 2021) applied a combination of Analytic Hierarchy Process (AHP) and Simple Additive Weighting (SAW) within a decision support system for culinary venue selection. Criteria such as hospitality, employee problem-solving skills, employee knowledge, food taste, physical cleanliness and service response time consistently emerge as crucial factors in various studies on restaurant consumer preferences (Krishnan et al., 2022).

Despite these existing applications, there remains a specific need for a DSS model tailored for culinary tourism restaurant selection in Semarang City, considering local preferences and addressing the complexities of multi-criteria decision-making in this particular geographic and cultural context. This study endeavors to bridge this gap by providing a structured DSS model tailored for culinary tourism restaurant selection in Semarang City, considering local preferences obtained through questionnaires.

Related Work and Research Gap Analysis

To position this study within the existing body of literature, Table 1 summarizes relevant prior research in multi-criteria decision-making for restaurant selection or similar applications. This table highlights the methods employed, the context of their application, and how our current study differentiates itself by combining AHP and SAW in the underexplored specific context of culinary tourism restaurant selection in Semarang City, integrating comprehensive criteria derived from local preferences.

Table 1. Comparison of Related Works

Author(s) & Year	Method(s) Used	Application Domain / Object	Key Criteria	Contribution/Focus	Limitations Addressed by Current Study
Alwedyan (2024)	AHP	Restaurant location selection	Costs, location, traffic patterns, accessibility	Identifying best restaurant locations based on specific factors	Focuses on location rather than overall multi-criteria ranking for culinary tourism, does not combine AHP with SAW.
Hanin & Adi (2023)	SAW	Cafe selection for students	Facilities, location, ambiance	Assisting students in cafe selection	Uses SAW alone, not combined with AHP for robust weight determination; different context (cafe vs. restaurant, student vs. general tourism).
Permatasari et al. (2021)	AHP & SAW	Culinary venue selection	(Implicit from paper)	DSS for strategic coffee shop location selection	General culinary venue; specific

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					context of Semarang's culinary tourism not explored with detailed local preferences.
Purnama et al. (2025)	SAW	Selecting best culinary establishments	(Implicit from paper)	DSS for digital marketing strategy	Uses SAW only; broader context than specific culinary tourism in Semarang.
Krishnan et al. (2022)	Hybrid MADM	Fast-food restaurant image improvement	Hospitality, problem-solving, knowledge, food taste, cleanliness, service response	Improving restaurant image	Different objective (image vs. selection); not specific to Semarang culinary tourism.
Current Study	AHP & SAW (Combined)	Culinary Tourism Restaurant Selection in Semarang City	Cleanliness, Location, Price, Ambiance, Taste, Rating	Develops a comprehensive DSS model for direct restaurant selection, integrating AHP for consistent criteria weights and SAW for objective ranking, tailored to local preferences in an underexplored context.	(N/A)

METHOD

This research employs a quantitative descriptive approach, utilizing a case study method and applying Multi-Criteria Decision Making (MCDM) techniques. A combination of the Analytic Hierarchy Process (AHP) and Simple Additive Weighting (SAW) methods is used to determine the priority of culinary restaurant alternatives in Semarang City based on a set of pre-defined criteria.

All data processing, including AHP calculations for criteria weights and SAW calculations for alternative rankings, was performed using Microsoft Excel to ensure accuracy and efficiency in complex matrix operations.

Research Design

This research employs a descriptive-quantitative design with a case study approach focused on the selection of culinary tourism restaurants in Semarang City. The study encompasses the following stages: (1) Identification of restaurant selection criteria; (2) Collection of criterion preference data from respondents; (3) Collection of alternative (restaurant) evaluation data from respondents; (4) Determination of criteria weights using the AHP method; (5) Ranking of alternatives using the SAW method; and (6) Analysis and interpretation of results.

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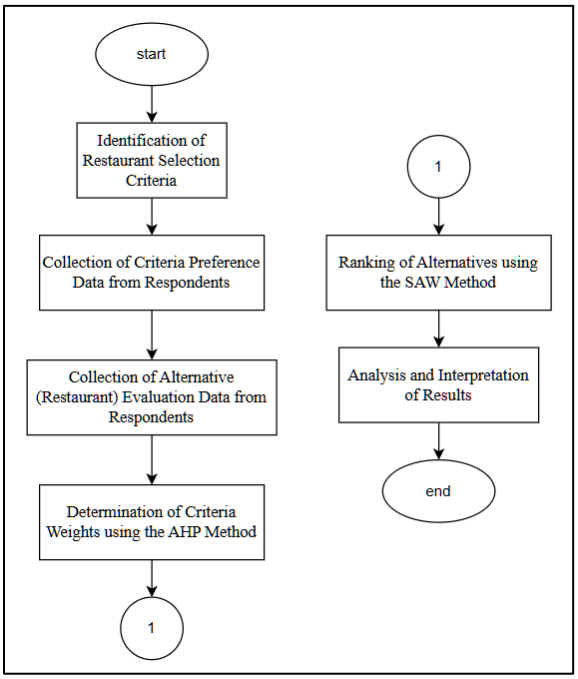


Fig. 1 Research Stages

Research Objects and Subjects

The objects of this research are 10 culinary tourism restaurants located in Semarang City, which will be referred to as alternatives (A). These alternatives will be denoted as A_1, A_2, …, A_{10}. The selection of these restaurants was based on their popularity and the diversity of culinary types offered. The subjects of this study involve two distinct groups of respondents:

a. Criterion Respondents

A total of 30 individuals participated in a checklist questionnaire to identify crucial criteria for recommending restaurants.

These respondents were selected based on their active engagement as culinary enthusiasts in Semarang City, typically frequenting various restaurants and possessing diverse dining experiences. This background ensures that their preferences are representative of a broad range of consumer perspectives relevant to culinary tourism.

b. Alternative Evaluation Respondents

A total of 10 individuals participated in a questionnaire to provide evaluations of the 10 culinary tourism restaurants based on the established criteria.

These respondents were selected for their familiarity with the specific restaurants being evaluated, ensuring they could provide informed and relevant assessments across all six established criteria.

Table 2. List of Restaurant Alternatives

Notation	Alternative
A1	Folkcafe at ALVA
A2	Gudeg Koyor Mbak Tum
A3	Lunpia Gang Lombok
A4	JJ Steak thereal
A5	Sate 88 Kota Lama
A6	Pelangi Cheese Chiffon Cake
A7	Warung Pecel Bu Ning
A8	Lekker Paimo
A9	Moaci Gemini
A10	Ikan Bakar Cianjur

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Data Collection

Primary data was collected through the distribution of questionnaires to respondents. The questionnaires were designed in two stages:

a. Criterion Identification Questionnaire

This questionnaire was distributed to 30 respondents to identify the most considered criteria for recommending restaurants. Respondents were asked to select 6 to 7 criteria from a list of 12 provided. The data gathered from this questionnaire were used to determine the main criteria and their weights via AHP.

b. Restaurant Evaluation Questionnaire

This questionnaire was distributed to 10 respondents to evaluate 10 culinary tourism restaurants based on the six established main criteria. Evaluations employed rating scales tailored to the characteristics of each criterion (Food Price: 1-3; Food Taste, Place Cleanliness, Location/Accessibility, Ambiance/Comfort, User Reviews/Ratings: 1-4). This data served as input for the SAW method.

Determination of Research Criteria

From an initial set of 12 comprehensively identified criteria, a selection and streamlining process was conducted based on the questionnaire results from 30 respondents. Six criteria that were consistently and significantly most frequently selected and deemed highly relevant were designated as the main criteria within the DSS model. These criteria will be denoted as $C_1, C_2, \ldots, C_6$.

Table 3. Restaurant Evaluation Criteria

Notation	Criterion	Description
C_1	Food Price	Cost
C_2	Food Taste	Benefit
C_3	Place Cleanliness	Benefit
C_4	Location / Accessibility	Benefit
C_5	Ambiance / Comfort	Benefit
C_6	User Reviews / Ratings	Benefit

This selection of the top six criteria was primarily driven by the relevance of respondent preference data, the computational efficiency of the model, and the need to maintain consistency in AHP calculations.

Data Analysis Method

The collected data were analyzed using a combination of AHP and SAW methods.

a. Determination of Criteria Weights using Analytic Hierarchy Process (AHP)

The AHP method is employed to determine the relative weights of each criterion. This process involves the construction of pairwise comparison matrices and the calculation of their consistency (Cetkovic et al., 2023).

1. Construction of Pairwise Comparison Matrices (A)

The pairwise comparison matrix is constructed by comparing each pair of criteria (C_i and C_j) against one another. The comparison values utilize Saaty's scale (1-9), where a value of 1 signifies 'equally important', 3 'slightly more important', 5 'strongly more important', 7 'demonstrably more important', and 9 'absolutely more important', with values 2, 4, 6, 8 serving as intermediate points (Cetkovic et al., 2023). This matrix is then simulated based on the frequency of criteria selection from the 30 respondents, where criteria with higher selection frequency are assumed to be more important.

$$A = \begin{pmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{12} & a_{22} & \cdots & a_{1n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{pmatrix} \quad (1)$$

Where a_{ij} represents the comparison value of criterion c_i relative to criterion c_j, with $a_{ij}={}^{1}/_{a_{ij}}$, and a_{ij}=1. Here, N denotes the number of criteria (6).

2. Normalization of Matrix and Priority Weight Calculation

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The comparison matrix is normalized by dividing each column element by its respective column sum (Saaty, 1980).

$$a'_{ij} = \frac{a_{ij}}{\sum_{k=1}^{n} a_{kj}} \quad (2)$$

Criteria weights (w_i) are calculated by averaging the values of each row in the normalized matrix (Saaty, 1980).

$$W_j = \frac{\sum_{k=1}^{n} a'_{kj}}{n} \quad (3)$$

3. Consistency Test

Matrix consistency is verified by computing the Consistency Index (CI) and Consistency Ratio (CR) (Saaty, 1980).

$$CI = \frac{\gamma_{max} - n}{n-1} \quad (4)$$

Where λmax is the maximum eigenvalue (the average of the results of multiplying the comparison matrix by the priority vector divided by the priority vector), and n is the number of criteria.

$$CR = \frac{CI}{RI} \quad (5)$$

Where RI (Random Index) is a random index whose value depends on n. For n=6, the RI value is 1.24. The matrix is considered consistent if CR < 0.10.

b. Ranking Alternatives using Simple Additive Weighting (SAW)

The SAW method is employed to rank 10 culinary tourism restaurants in Semarang City based on the criteria weights derived from AHP and the alternative evaluation values (Taherdoost, 2023).

1. Prepare the Initial Matrix

$$X = \begin{pmatrix} x_{11} & x_{12} & \cdots & x_{1n} \\ x_{12} & x_{22} & \cdots & x_{1n} \\ \vdots & \vdots & \ddots & \vdots \\ x_{m1} & x_{m2} & \cdots & x_{mn} \end{pmatrix} \quad (6)$$

Where xij represents the average evaluation score of alternative A_i for criterion C_j. Here, M denotes the number of alternatives (10), and n is the number of criteria (6).

2. Normalizing the Value of Criteria

The normalization process converts the x_{ij} values into a uniform scale [0,1] to allow for comparison across criteria with different scales. The normalization formula depends on the type of criterion (Benefit or Cost).
Normalization Formula (R) for Cost Criteria:

$$r_{ij} = \frac{x_{ij}}{\max(x_{ij})} \quad (7)$$

Normalization Formula (R) for Benefit Criteria:

$$r_{ij} = \frac{\min(x_{ij})}{x_{ij}} \quad (8)$$

Where x_{max} and x_{min} are the maximum and minimum values, respectively, for criterion C_j.

3. Integrating the Values of the Criteria and Weights

The preference value for each alternative (A_i) is calculated by summing the products of the normalized value of each criterion (r_{ij}) and its corresponding criterion weight (w_j) derived from AHP.

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$$V_i = \sum_{j=1}^{n}(w_j\, r_{ij}) \qquad (9)$$

4. Ranking the Alternatives to Choose the Best One
   The restaurant alternatives (A_i) are then ordered based on their preference values (V_i), from the highest to the lowest.

RESULT

This section presents the research findings regarding the selection of culinary tourism restaurants in Semarang City. Based on the application of the Analytic Hierarchy Process (AHP) and Simple Additive Weighting (SAW) methods, the results demonstrate consistent criteria priority weights and an objective ranking of restaurants. Both methods are analyzed in depth to provide a scientific interpretation of each finding.

AHP Results (Criteria Weights)

The application of the AHP method commenced with the construction of a pairwise comparison matrix based on the selection frequency of criteria (C_j) from 30 respondents. This matrix reflects the relative importance levels among criteria. From this matrix, the priority weights (priority vector) for each criterion were calculated.

Table 4. AHP Pairwise Comparison Matrix

Criteria	C1	C2	C2	C4	C5	C6
C1	1	1	1	1	1	3
C2	1	1	0.33	0.33	1	1
C3	1	3	1	1	1	3
C4	1	3	1	1	1	3
C5	1	1	1	1	1	3
C6	0.33	1	0.33	0.33	0.33	1

Based on the calculations from the matrix above, the priority weights (W_j) for each criterion are obtained as follows:

Table 5. AHP Criteria Weights

Criteria	AHP Weights (w_j)
C3	0.21964
C4	0.21964
C1	0.18631
C5	0.18631
C2	0.11488
C6	0.07321

The consistency test of the pairwise comparison matrix yielded a λmax value, a Consistency Index (CI) of 0.0422, and a Consistency Ratio (CR) of 0.0341. Since the CR value is less than 0.10 (0.0341 < 0.10), it can be concluded that the constructed pairwise comparison matrix is consistent. Consequently, the derived criteria weights are valid and acceptable for use in subsequent processes.

From the obtained criteria weights, it is evident that Cleanliness (C3) and Location (C4) simultaneously possess the highest weights, both at 0.21964. This indicates that these two factors are the most considered aspects and are deemed crucial by respondents when recommending a restaurant. This aligns with expectations within the culinary industry, where cleanliness is a fundamental prerequisite and location determines accessibility. Furthermore, Price (C1) and Ambiance (C5) also hold significant weights, at 0.18631, suggesting that economic value and environmental comfort are also important considerations. Meanwhile, while Taste (C2) (0.11488) and Rating (C6) (0.07321) are important, they possess relatively lower weights compared to other criteria within the measured collective preference context.

SAW Decision Matrix and Normalization

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After obtaining the criteria weights (W_j) from AHP, the next step involves preparing the decision matrix for the SAW method. This matrix contains the average evaluations from 10 respondents for 10 restaurant alternatives (A_i) across the six established criteria (C_j).

Table 6. Decision Matrix

Alternative	Criteria					
	C1	C2	C3	C4	C5	C6
A1	2	3.9	3.8	3.9	3.9	3.9
A2	1.8	2.8	1	3.9	1.1	2.9
A3	2	1	1	2.9	1	2.9
A4	1.9	3.9	2.9	2.8	2.9	2.9
A5	2.8	2.9	2.8	3.9	2.9	2.8
A6	2.9	3.9	3.9	2.9	3.9	3.8
A7	1.1	3.1	1	1	2.9	1.8
A8	1	2.9	1	1.1	1	1.9
A9	2.1	1.1	2.9	2.9	2.9	1.9
A10	2.9	3.1	3.9	3.9	3.9	3.9

The decision matrix is then normalized to transform all values into a uniform scale [0,1], taking into account the type of criterion (Benefit or Cost).

Table 7. SAW Normalized Matrix

Alternative	Criteria					
	C1	C2	C3	C4	C5	C6
A1	0.53	1	0.97	1	1	1
A2	0.56	0.72	0.26	1	0.28	0.74
A3	0.5	0.26	0.26	0.74	0.26	0.74
A4	0.53	1	0.74	0.78	0.74	0.74
A5	0.36	0.74	0.72	1	0.74	0.72
A6	0.34	1	1	0.74	1	0.97
A7	0.91	0.77	0.26	0.26	0.74	0.46
A8	1	0.74	0.26	0.28	0.26	0.49
A9	0.48	0.28	0.74	0.74	0.74	0.49
A10	0.34	0.79	1	1	1	1

Restaurant Ranking Results using SAW

The final preference value (V_i) for each restaurant alternative (A_i) is calculated by summing the products of the normalized value of each criterion (r_{ij}) and its corresponding criterion weight (W_j) derived from AHP. Restaurant alternatives are then ranked based on their highest preference values.

Table 8. Restaurant Ranking Results using SAW Method

Alternative	Preference Value (V)	Ranking
A1	0.8656	1
A10	0.8524	2
A6	0.8173	3
A5	0.7203	4
A4	0.7067	5
A9	0.6094	6
A2	0.5694	7
A7	0.5621	8
A8	0.4764	9
A3	0.4443	10

The ranking results indicate that Folkcafe at ALVA (A1) secured the top position as the most recommended restaurant with a preference value of 0.8656. The second position was occupied by Ikan Bakar Cianjur (A10) with a preference value of 0.8524, followed by Pelangi Cheese Chiffon Cake (A6) in the third rank with a preference value

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of 0.8173. These top-ranked restaurant alternatives generally demonstrated strong performance across high-weighted criteria such as Cleanliness and Location, in addition to competitive scores on other criteria.

Folkcafe at ALVA exhibited high normalized values (approaching 1.00) across nearly all benefit criteria, including cleanliness, ambiance, and reviews, as well as a favorable normalized price value. This significantly contributed to its total preference value. Conversely, lower-ranked restaurant alternatives, such as Lunpia Gang Lombok, showed low normalized values in crucial criteria like cleanliness and taste, directly impacting their preference values.

These findings are consistent with the criteria weights derived from AHP, where cleanliness and location emerged as primary determinants. This indicates that the combination of criteria priorities based on respondent preferences and the actual performance of alternatives against these criteria effectively yields objective and structured recommendations. These results can serve as a valuable guide for both tourists and local communities in making restaurant selection decisions that align with majority preferences.

Sensitivity Analysis

To assess the robustness of the proposed decision model and evaluate the stability of the ranking results against potential changes in criteria weights, a sensitivity analysis was conducted. This analysis investigates how the final ranking of restaurants would change if the weights of the most influential criteria were varied. For this study, we focused on varying the weights of the top two criteria, Cleanliness (C3) and Location (C4), as they possess the highest and nearly identical weights (0.21964 each).

The sensitivity analysis involved incrementally increasing and decreasing the weights of C3 and C4 by ±10%, while proportionally adjusting the weights of the other criteria to maintain a sum of 1.0. The SAW method was then re-executed with these adjusted weights to observe any changes in the final restaurant ranking.

Table 9. Sensitivity Analysis

Scenario	C1 Weight (New)	C2 Weight (New)	C3 Weight (New)	C4 Weight (New)	C5 Weight (New)	C6 Weight (New)	New Rank 1	New Rank 2	New Rank 3	Notes on Rank Changes
Baseline	0.18631	0.11488	0.21964	0.21964	0.18631	0.07321	A1	A10	A6	(Original ranking)
C3+10%	0.18231	0.11241	0.23642	0.21492	0.18231	0.07164	A1	A10	A6	No change in top 3.
C3 -10%	0.19049	0.11746	0.20212	0.22458	0.19049	0.07486	A1	A10	A6	No change in top 3.
C4+10%	0.18231	0.11241	0.21492	0.23642	0.18231	0.07164	A1	A10	A6	No change in top 3.
C4 -10%	0.19049	0.11746	0.22458	0.20212	0.19049	0.07486	A1	A10	A6	No change in top 3.

DISCUSSIONS

This section provides an in-depth interpretation of the research findings, discussing the AHP criteria weights and SAW alternative ranking within the context of a case study on culinary tourism restaurant selection in Semarang City. The discussion also encompasses a comparison with relevant literature, along with the practical and theoretical implications of the obtained results.

The AHP criteria weights clearly indicate that Cleanliness and Location are the most crucial factors for respondents when recommending a restaurant, possessing nearly identical priority weights. This prioritization aligns with expectations within the culinary industry, where hygiene serves as a fundamental prerequisite and location significantly determines customer convenience, especially for tourists. A study by (Krishnan et al., 2022) also underscores the importance of Cleanliness as primary attributes in restaurant consumer preferences. Criteria such as Price and Ambiance also exhibit significant weights, suggesting that economic value and a comfortable dining experience cannot be overlooked. However, it is important to note that Taste and Rating, although relevant, possess relatively lower priority weights. This might reflect the subjective nature of taste, which varies among individuals, or the fact that online ratings often represent an aggregate of various aspects that do not always align with primary

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priorities. The consistency of the AHP calculations (CR = 0.0341 < 0.10) further substantiates the validity of these criteria weights.

The ranking derived from the SAW method reveals a clear distribution, with Folkcafe at ALVA, Ikan Bakar Cianjur, and Pelangi Cheese Chiffon Cake securing the top positions. The success of these restaurants is attributed to their superior performance on high-weighted criteria, particularly Cleanliness and Location. For instance, Folkcafe at ALVA exhibited high normalized values (approaching 1.00) across nearly all benefit criteria and offered competitive pricing after normalization, which collectively propelled it to the first rank. Conversely, lower-ranked restaurants likely showed suboptimal values in these dominant criteria, consequently diminishing their total preference values. This AHP-SAW hybrid approach proved effective in integrating subjective preferences (through AHP for weights) with objective alternative evaluations (through SAW for scores). This finding is consistent with (Suartini et al., 2023), who highlighted the strength of hybrid methods in multi-criteria decision-making.

To further validate the reliability of these results and test the model's resilience, a sensitivity analysis was conducted by altering the weight of cleanliness by ±10%. It was observed that the top-3 ranks remained consistent, indicating the robust stability of the proposed decision support model against moderate fluctuations in criteria importance.

This research significantly contributes to the existing literature on Decision Support Systems (DSS) and Multi-Criteria Decision Making (MCDM) by offering a detailed case study on the novel application of a combined AHP and SAW approach within the underexplored context of local culinary tourism restaurant selection in Semarang City. The integration of AHP and SAW contributes to the growing body of user-centric DSS development in tourism, particularly in culinary domains. Unlike prior works that focused on location or cost alone, this study emphasizes holistic evaluation. Specifically, it addresses the identified gap in comprehensive decision support models that integrate both subjective preference elicitation for criteria weighting (AHP) and objective alternative evaluation (SAW) for this particular niche. It demonstrates the validity and effectiveness of this hybrid model within the tourism domain.

From a practical standpoint, these ranking results offer an objective guide for both tourists and local residents in Semarang City to select restaurants that align with majority preferences. For culinary business owners, these findings provide valuable insights into the key factors that should be prioritized (cleanliness, location, ambiance) to enhance competitiveness and customer satisfaction. Local governments and tourism stakeholders can also leverage this data for more focused culinary promotion strategies.

While this study is grounded in the specific preferences of culinary enthusiasts in Semarang City, the fundamental insights regarding the paramount importance of Cleanliness and Location in restaurant selection may possess broader implications. These criteria are widely recognized as universal prerequisites for dining establishments, suggesting that the model's prioritization of these factors could be applicable to other urban culinary tourism destinations, albeit with contextual adjustments for other criteria.

Nevertheless, it is important to acknowledge that this study has certain limitations. The sample size of respondents (30 for criteria weighting and 10 for alternative evaluation) might restrict the generalizability of the findings. Additionally, the selected criteria and alternatives are static, representing conditions at the time the research was conducted. Consumer preferences and market dynamics may evolve over time.

CONCLUSION

This study advances methodological practice by demonstrating how AHP–SAW hybridization can yield stable, valid, and user-informed recommendations in urban culinary tourism DSS. This research successfully implemented a combination of the Analytic Hierarchy Process (AHP) and Simple Additive Weighting (SAW) methods for the selection of culinary tourism restaurants in Semarang City. The AHP method successfully determined consistent criteria priority weights (CR = 0.0341), identifying Cleanliness and Location as the most crucial criteria. The application of SAW yielded an objective ranking of restaurants, with Folkcafe at ALVA, Ikan Bakar Cianjur, and Pelangi Cheese Chiffon Cake securing the top three positions as the most recommended establishments. The findings of this study can serve as an effective tool for both local communities and tourists in making more informed restaurant selection decisions, while also providing insights for culinary business owners regarding the factors most valued by customers.

To further extend the contributions of this research, the following recommendations for future studies are proposed:

a. Future research could consider directly collecting AHP pairwise comparison data from a panel of experts or key stakeholders within the culinary and tourism industries. This aims to validate and enrich the obtained criteria weights, thereby reflecting a more comprehensive, multidimensional perspective.

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b. Developing this decision support system into a web-based platform or mobile application represents a prospective next step. Such implementation would enable end-users (tourists and local communities) to interact directly, input individual preferences, and receive real-time restaurant recommendations, thereby significantly increasing the practical utility of this research.

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