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A Web-Based Decision Support System For Evaluating The Best Homestay Using The Simple Additive Weighting (SAW) Method

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Abstract

The rapid growth of the tourism sector in Pagar Alam City has increased the demand for quality accommodation, particularly homestays. As recorded by the Pagar Alam City Tourism Office, 132 homestays are currently in operation, offering tourists a wide range of alternatives with varying prices, facilities, locations, cleanliness, and service quality. However, the absence of an integrated evaluation system makes it difficult for tourists to objectively compare available options and select the most suitable homestay. This study aims to develop a web-based Decision Support System (DSS) for selecting the best homestay using the Simple Additive Weighting (SAW) method. The research employed the Waterfall software development model, consisting of requirements analysis, system design, implementation, testing, and system deployment. The study used 13 homestays that participated in the 2022 Best Homestay Assessment organized by the Pagar Alam City Tourism Office as the research sample, ensuring reliable assessment data and measurable quality indicators. Five evaluation criteria were applied, namely price, facilities, location, cleanliness, and service, each assigned a predetermined weight based on its level of importance. The SAW method was implemented to normalize criterion values, calculate preference scores, and rank homestay alternatives according to their overall performance. The developed system successfully generated objective and transparent recommendations for the best homestays through an accessible web-based platform. Functional testing confirmed that the system performed all required processes accurately, including data management, normalization, preference calculation, and ranking generation. The findings indicate that the proposed decision support system effectively supports tourists in making informed accommodation choices while assisting tourism stakeholders in conducting a more systematic, efficient, and objective homestay evaluation process in Pagar Alam City.

Keywords: Decision Support System, Homestay Selection, Simple Additive Weighting (SAW), Web-Based System, Pagar Alam City

INTRODUCTION

Tourism has become one of the world's fastest-growing economic sectors, contributing significantly to economic development, employment generation, and regional competitiveness. According to the United Nations World Tourism Organization (UN Tourism), sustainable tourism development depends not only on attractive destinations but also on the availability of high-quality accommodation that enhances visitors' travel experiences (UN Tourism, 2023). Among various accommodation types, homestays have gained increasing popularity because they provide affordable lodging while allowing tourists to experience local culture and community life, thereby supporting the principles of community-based tourism (UNWTO, 2020).

Pagar Alam City, located in South Sumatra Province, Indonesia, is recognized as one of the region's prominent tourism destinations due to its mountainous landscapes, waterfalls, plantations, and cultural attractions. The continuous increase in tourist arrivals has stimulated the rapid growth of accommodation facilities, particularly homestays. According to data from the Pagar Alam City Tourism Office, there are currently 132 registered homestays operating throughout the city. While this large number of accommodation options provides greater flexibility for visitors, it also creates challenges in selecting the most suitable homestay because each offers different prices, facilities, locations, cleanliness standards, and service quality. Consequently, tourists often rely on subjective judgments, fragmented online information, or personal recommendations, which may not accurately reflect the overall quality of available accommodations.

Selecting the most appropriate accommodation represents a multi-criteria decision-making (MCDM) problem because several evaluation criteria must be considered simultaneously. In such situations, decision-makers require systematic tools capable of evaluating multiple alternatives objectively. A Decision Support System (DSS) provides an effective solution by integrating data management, analytical models, and user-friendly interfaces to support decision-making processes in semi-structured and unstructured environments (Turban et al., 2011). DSS applications have been widely implemented in various domains, including supplier selection, employee performance evaluation, scholarship selection, hotel recommendation, and tourism management.

Among the numerous methods employed in Decision Support Systems, the Simple Additive Weighting (SAW) method is one of the most widely adopted due to its simplicity, computational efficiency, and transparent ranking mechanism. The SAW method determines the overall preference value of each alternative by normalizing criterion values, assigning weights according to their importance, and calculating a weighted summation. Because of its straightforward mathematical formulation and ease of interpretation, SAW is particularly suitable for web-based decision support applications involving multiple evaluation criteria (Fishburn, 1967; Kusumadewi et al., 2006).

Previous studies have successfully applied the SAW method to hotel selection, boarding house recommendation, and other accommodation-related decision problems. These studies demonstrate that SAW can improve the objectivity and consistency of ranking alternatives. However, limited research has specifically focused on homestay evaluation in tourism destinations such as Pagar Alam City. Furthermore, many existing studies emphasize methodological implementation without developing an integrated web-based platform that allows tourists to access recommendations online in real time. This research gap highlights the need for a practical decision support system capable of integrating homestay data, processing multiple evaluation criteria automatically, and presenting objective recommendations through an accessible web application.

Therefore, this study aims to develop a web-based Decision Support System for selecting the best homestay using the Simple Additive Weighting (SAW) method. The study evaluates 13 homestays that participated in the 2022 Best Homestay Assessment conducted by the Pagar Alam City Tourism Office, ensuring reliable and measurable evaluation data. Five assessment criteria price, facilities, location, cleanliness, and service are incorporated into the SAW model, while the system is developed using the Waterfall software development methodology. The proposed system is expected to provide objective, transparent, and efficient homestay recommendations, thereby assisting tourists in making informed accommodation decisions while supporting local tourism stakeholders in improving service quality and destination competitiveness.

RESEARCH METHODS

This study employed an applied research approach using a quantitative method to develop and evaluate a web-based Decision Support System (DSS) for selecting the best homestay in Pagar Alam City. The research focused on implementing the Simple Additive Weighting (SAW) method to rank homestay alternatives based on multiple evaluation criteria. The system was developed following the Waterfall software development model, which consists of requirements analysis, system design, implementation, testing, and deployment.

The research was conducted in Pagar Alam City, South Sumatra, Indonesia. The population consisted of 132 registered homestays operating in the city, according to data obtained from the Pagar Alam City Tourism Office. Because the objective of this study was to implement and evaluate the decision support system rather than to generalize findings to the entire population, purposive sampling was employed. Thirteen homestays were selected as research samples based on predetermined criteria, including active operational status, availability of complete evaluation data, and participation in the 2022 Best Homestay Assessment conducted by the Pagar Alam City Tourism Office. The selected

homestays possessed complete information required for evaluating the five assessment criteria used in this study.

Data were collected through three complementary techniques. Observation was conducted to obtain information regarding the physical condition, facilities, cleanliness, and surrounding environment of each homestay. Interviews with homestay owners or managers were carried out to collect information related to pricing policies, service quality, and operational characteristics. Documentation techniques were used to obtain supporting data, including photographs, facility descriptions, and administrative records. These methods ensured the completeness and reliability of the evaluation data used in the decision-making process.

Five decision criteria were employed to evaluate each homestay: price (C1), facilities (C2), location (C3), cleanliness (C4), and service (C5). Price was treated as a cost criterion, whereas the remaining four criteria were categorized as benefit criteria. The weights assigned to the criteria were 0.25 for price, 0.25 for facilities, 0.20 for location, 0.15 for cleanliness, and 0.15 for service. These weights were determined based on literature review, tourism accommodation characteristics, and the relative importance of each criterion from the perspective of tourists.

The Simple Additive Weighting (SAW) method was implemented to determine the ranking of homestay alternatives. The decision-making process consisted of four main stages: (1) constructing the decision matrix from the collected evaluation data; (2) normalizing the decision matrix using benefit and cost normalization formulas; (3) calculating the weighted preference value for each alternative by multiplying normalized values with their corresponding criterion weights; and (4) ranking all alternatives according to their final preference scores. The homestay with the highest preference value was identified as the best alternative.

The decision support system was implemented as a web-based application using PHP as the server-side programming language and MySQL as the relational database management system. Apache web server and the Laragon development environment were utilized during system development, while Visual Studio Code served as the integrated development environment. These technologies were selected because of their compatibility, open-source availability, and suitability for developing dynamic web applications.

System verification was conducted using Black Box Testing, which evaluated the functional performance of the application without considering its internal program structure. The testing process covered user authentication, homestay data management, criteria and weighting management, SAW calculation procedures, and ranking generation. The results confirmed that all system functions operated correctly and produced consistent ranking outputs according to the predefined decision criteria, demonstrating that the developed web-based decision support system is capable of providing objective and reliable homestay recommendations.

RESULTS AND DISCUSSION

System Development Results

The web-based Decision Support System (DSS) was successfully developed to assist tourists in selecting the most suitable homestay in Pagar Alam City. The system integrates homestay data, evaluation criteria, the Simple Additive Weighting (SAW) calculation model, and recommendation results into a single web platform. The application provides two categories of users, namely administrators and general users. Administrators are responsible for managing homestay data,

assessment criteria, weights, and evaluation scores, whereas users can access homestay information and recommendation results without performing manual calculations.

Figure 1. Main Interface of the Decision Support System

Figure 1 illustrates the homepage of the developed decision support system. The interface provides users with information regarding available homestays, assessment criteria, and access to the recommendation feature. The website was designed with a simple and responsive interface to improve usability and facilitate information access.

Implementation of the Simple Additive Weighting Method

The recommendation process was performed using the Simple Additive Weighting (SAW) method. Five evaluation criteria were employed, consisting of price (C1), facilities (C2), location (C3), cleanliness (C4), and service quality (C5). Price was classified as a cost criterion, whereas the remaining criteria were considered benefit criteria. The assigned criterion weights were 0.25, 0.25, 0.20, 0.15, and 0.15, respectively.

Table 1. Decision Criteria and Weights

Code	Criterion	Attribute	Weight
C1	Price	Cost	0.25
C2	Facilities	Benefit	0.25
C3	Location	Benefit	0.20
C4	Cleanliness	Benefit	0.15
C5	Service	Benefit	0.15

Table 1 presents the evaluation criteria used in determining the best homestay. The weighting scheme indicates that price and facilities were considered the most influential factors in tourists' accommodation preferences. Following data collection, each homestay was evaluated according to the five criteria. The collected scores formed the decision matrix, which was subsequently normalized according to the SAW algorithm before calculating the preference values.

Figure 2. Flow of SAW Calculation

Figure 2 illustrates the stages of the SAW algorithm, beginning with the construction of the decision matrix, followed by normalization, weighted multiplication, preference value calculation, and final ranking generation.

Homestay Ranking Results

The developed system automatically calculated the preference values of all homestay alternatives after the normalization and weighting processes. The resulting preference values were then sorted from the highest to the lowest score to determine the recommended homestay.

Table 2. Final Ranking of Homestay Alternatives Based on the SAW Method

Rank	Homestay Name	Preference Value
1	Homestay RBA	0.956
2	Homestay Teras	0.941
3	Mezanine Homestay	0.926
4	Homestay R	0.892
5	Homestay Zahra	0.851
6	Romo Homestay	0.838
7	Banana Homestay	0.838
8	Homestay Alev	0.836
9	Anaqi Homestay	0.794
10	Safira Homestay	0.792
11	Azalea Homestay	0.777
12	Pondok Teteh Homestay	0.761
13	Wahyudi Homestay	0.694

Table 2 presents the final ranking of the 13 homestay alternatives generated using the Simple Additive Weighting (SAW) method. The ranking was determined by calculating the weighted preference value for each homestay based on five evaluation criteria: price, facilities, location, cleanliness, and service quality. Homestay RBA achieved the highest preference value (0.956), indicating that it represents the most recommended alternative among all evaluated homestays. It was followed by Homestay Teras (0.941) and Mezanine Homestay (0.926), which also demonstrated excellent overall performance across the assessment criteria. In contrast, Wahyudi Homestay obtained the lowest preference value (0.694), suggesting comparatively lower performance based on the established evaluation criteria. These findings demonstrate that the SAW method effectively ranks homestay alternatives objectively and consistently, thereby supporting tourists in selecting accommodation that best matches the predefined evaluation criteria.

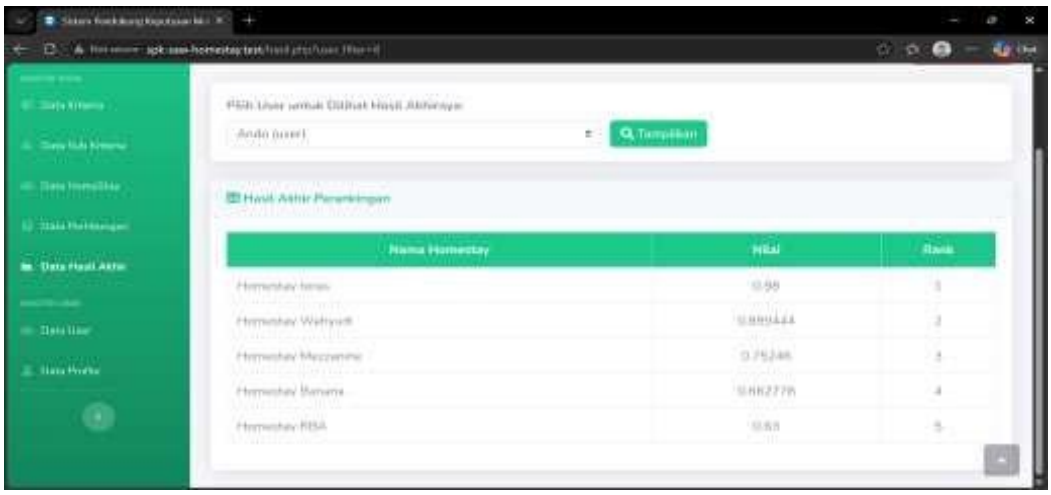

Figure 3. Ranking Results Display

Figure 3 presents the ranking page displayed by the web application. The recommendation results are automatically generated after the system performs the SAW calculation, allowing users to compare all available homestays objectively.

System Testing Results

The developed application was evaluated using Black Box Testing to verify that each functional component operated according to the specified requirements. Functional testing covered user authentication, homestay data management, criteria management, evaluation processing, SAW computation, and recommendation generation.

Table 3. Black Box Testing Results

No.	Test Scenario	Test Process	Expected Result	Testing Result	Status
1	Administrator Login	Enter administrator username and password	The system displays the administrator dashboard	Successful	Valid
2	Add Criteria Data	Add new evaluation criteria	Criteria data are stored in the database	Successful	Valid
3	Add Sub-Criteria Data	Add new sub-criteria	Sub-criteria data are stored in the database	Successful	Valid
4	Add Homestay Data	Add a new homestay record	Homestay data are stored successfully	Successful	Valid
5	Input Assessment Data	Enter homestay evaluation scores	Assessment data are stored successfully	Successful	Valid
6	SAW Calculation Process	Execute the SAW calculation	The system calculates preference values correctly	Successful	Valid
7	Display Final Results	Generate recommendation results	The system displays the homestay ranking	Successful	Valid
8	System Logout	Log out from the application	The system returns to the login page	Successful	Valid
9	User Homestay Submission	Submit homestay data by users	User-submitted homestay data are stored successfully	As Expected	Valid
10	Homestay Data Filtering	Apply filtering options	The system displays homestays according to the selected filter	As Expected	Valid
11	Homestay Data Sorting	Apply sorting options	The system sorts homestays according to the selected order	As Expected	Valid

Table 3 summarizes the results of the Black Box Testing conducted to evaluate the functional performance of the developed web-based decision support system. The testing covered all major system functionalities, including administrator authentication, management of criteria and homestay data, assessment data input, execution of the Simple Additive Weighting (SAW) calculation, recommendation generation, user data submission, filtering, sorting, and system logout. All test scenarios produced the expected outcomes, with every function classified as Valid. No functional errors were identified during the testing process, indicating that the system operated reliably and consistently. These findings demonstrate that the developed application satisfies its functional requirements and is suitable for supporting objective and efficient homestay selection through a web-based decision support system.

CONCLUSION

This study successfully developed a web-based Decision Support System (DSS) for selecting the best homestay in Pagar Alam City using the Simple Additive Weighting (SAW) method. The developed system effectively manages homestay information, evaluation criteria, assessment data, and the SAW calculation process, while providing structured and user-friendly recommendation results through a web-based platform.

The implementation of the SAW method proved effective in evaluating and ranking homestay alternatives based on five decision criteria, namely price, facilities, location, cleanliness, and service quality. By applying decision matrix construction, normalization, weighting, and preference value calculation, the system generated objective and transparent rankings for all homestay alternatives. Among the evaluated alternatives, Homestay RBA achieved the highest preference value (0.956), indicating that it is the most recommended homestay according to the predefined evaluation criteria.

The functional evaluation demonstrated that all system features operated correctly, with Black Box Testing confirming that every tested function met the expected requirements without functional errors. Furthermore, user evaluation involving 38 respondents yielded an overall acceptance score of 88.63%, categorized as "Very Good," indicating a high level of user satisfaction and acceptance. These findings suggest that the proposed decision support system provides an efficient, objective, and reliable tool for assisting tourists and stakeholders in selecting suitable homestays while supporting more effective tourism accommodation management in Pagar Alam City.

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