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Implementation of the Simple Additive Weighting Method in a Decision Support System for Tourism Destination Selection

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Abstrak

Pemilihan destinasi wisata merupakan proses pengambilan keputusan yang kompleks karena melibatkan berbagai kriteria, seperti biaya, aksesibilitas, fasilitas, keamanan, dan daya tarik. Pesatnya perkembangan informasi pariwisata melalui platform digital telah meningkatkan jumlah alternatif destinasi yang tersedia, sehingga menyulitkan wisatawan dalam menentukan pilihan yang paling sesuai secara rasional dan transparan. Kondisi ini menunjukkan perlunya pendekatan pendukung keputusan yang terstruktur untuk mengurangi subjektivitas dan meningkatkan kualitas pengambilan keputusan. Berdasarkan permasalahan tersebut, penelitian ini mengusulkan implementasi Sistem Pendukung Keputusan (SPK) untuk pemilihan destinasi wisata menggunakan metode Simple Additive Weighting (SAW) sebagai teknik pengambilan keputusan multikriteria. Sistem yang dikembangkan memungkinkan pengguna untuk mengevaluasi destinasi wisata berdasarkan bobot kriteria yang ditentukan oleh pengguna serta nilai atribut yang telah dinormalisasi, sehingga mendukung pengambilan keputusan yang fleksibel dan mudah dipahami. Kontribusi utama penelitian ini terletak pada penerapan praktis metode SAW ke dalam SPK yang menekankan kesederhanaan, transparansi, dan kemudahan penggunaan. Evaluasi sistem dilakukan menggunakan data destinasi wisata nyata, dan hasilnya menunjukkan bahwa SPK berbasis SAW mampu menghasilkan peringkat destinasi yang konsisten dan rasional sesuai dengan kriteria dan bobot yang diberikan. Untuk penelitian selanjutnya, sistem ini dapat dikembangkan dengan mengintegrasikan metode pengambilan keputusan hibrida, mekanisme pembobotan adaptif, serta penggunaan dataset yang lebih besar guna meningkatkan ketahanan, personalisasi, dan skalabilitas sistem.

Kata Kunci— *Sistem Pendukung Keputusan, Pemilihan Destinasi Wisata, Simple Additive Weighting, Pengambilan Keputusan Multikriteria, Metode SAW.*

Abstract

Tourism destination selection is a complex decision-making process that involves multiple criteria, such as cost, accessibility, facilities, safety, and attractiveness. The rapid growth of tourism information available through digital platforms has increased the number of available alternatives, making it difficult for tourists to identify destinations that best match their preferences in a rational and transparent manner. This condition highlights the need for a structured decision support approach to reduce subjectivity and improve decision quality. Motivated by this challenge, this research proposes the implementation of a Decision Support System (DSS) for tourism destination selection using the Simple Additive Weighting (SAW) method as a multi-criteria decision-making technique. The proposed system enables users to evaluate tourism destinations based on user-defined criteria weights and normalized attribute values, allowing flexible and interpretable decision-making. The main contribution of this study lies in the practical integration of the SAW method into a functional DSS that emphasizes

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simplicity, transparency, and usability. The system is evaluated using real tourism destination data, and the results demonstrate that the SAW-based DSS is able to produce consistent and rational rankings aligned with the assigned criteria and weights. The evaluation confirms that destinations with superior overall performance achieve higher preference values, validating the effectiveness of the proposed approach. For future work, the system can be enhanced by incorporating hybrid decision-making methods, adaptive weighting mechanisms, and larger datasets to improve robustness, personalization, and scalability.

Keywords— *Decision Support System, Tourism Destination Selection, Simple Additive Weighting, Multi-Criteria Decision Making, SAW Method.*

1. INTRODUCTION

Tourism has become one of the most dynamic sectors contributing significantly to regional and national economic growth. The rapid advancement of information and communication technologies has transformed how tourists search for information, compare destinations, and make travel decisions. Digital platforms, online travel agencies, and recommendation systems have increased the availability of tourism-related information, offering users a wide range of destination options. However, this abundance of information also introduces complexity, as tourists are often required to evaluate multiple alternatives based on various criteria such as cost, accessibility, facilities, safety, cultural value, and environmental conditions. In many developing tourism regions, destination selection is still conducted based on subjective judgment, personal experience, or limited information sources, which may result in suboptimal decision-making. From a computational perspective, this condition highlights the need for systematic, data-driven approaches that can assist users in making rational and transparent decisions. Decision Support Systems (DSS) have emerged as a critical component in addressing such multi-criteria decision-making problems by integrating data, analytical models, and user-friendly interfaces to support complex decision processes in tourism management and planning [1], [2].

Despite the growing adoption of digital tourism platforms, a general problem persists in the selection of tourism destinations, particularly when decision-makers are faced with multiple conflicting criteria. Tourists often prioritize different factors depending on their preferences, travel purposes, and constraints, leading to uncertainty and inconsistency in decision outcomes. From the system developer's perspective, designing a DSS that can effectively accommodate these varying preferences while maintaining computational efficiency and interpretability remains a challenge. Existing tourism recommendation systems frequently rely on collaborative filtering or content-based approaches, which may suffer from cold-start problems, lack of transparency, or limited adaptability to explicit user-defined criteria [3]. Moreover, many prior studies focus on recommendation accuracy without adequately addressing the explainability of the decision-making process, which is crucial for user trust and acceptance. In the context of decision science, tourism destination selection can be formulated as a multi-criteria decision-making (MCDM) problem, where alternatives must be ranked based on weighted criteria. However, the practical implementation of MCDM techniques in real-world tourism DSS applications is still limited, particularly in terms of simplicity, scalability, and ease of integration into web-based or mobile systems [4], [5].

The primary goal of this research is to design and implement a Decision Support System for tourism destination selection using the Simple Additive Weighting (SAW) method as the core decision-making model. This study aims to provide a systematic framework that enables users to evaluate tourism destinations objectively based on multiple criteria and predefined weights. The motivation behind choosing the SAW method lies in its conceptual simplicity, computational efficiency, and proven effectiveness in various decision-making

domains, including supplier selection, scholarship assessment, healthcare prioritization, and service quality evaluation [6]–[8]. Unlike more complex MCDM techniques that may require extensive parameter tuning or advanced mathematical modeling, SAW offers a straightforward weighted summation approach that is easy to understand and implement. This characteristic makes SAW particularly suitable for tourism DSS applications, where transparency and user comprehension are essential. Furthermore, the increasing demand for intelligent tourism systems, often referred to as smart tourism, underscores the importance of integrating decision support mechanisms that can adapt to user preferences while maintaining clarity in the ranking process [9].

To address the identified problems, this research proposes a DSS architecture that integrates the SAW method for ranking tourism destinations based on normalized criteria values and user-defined weights. The proposed solution involves several stages, including criteria identification, data normalization, weighted scoring, and ranking generation. The system is designed to allow flexibility in modifying criteria weights, enabling personalization according to user needs. The main contribution of this study lies in the practical implementation of the SAW method within a functional DSS tailored for tourism destination selection, demonstrating how a simple yet robust MCDM technique can be effectively applied in a real-world context. In addition, this research contributes to the existing literature by providing an evaluative analysis of the system's performance, including ranking consistency and usability assessment. The evaluation is conducted using real tourism destination data to validate the effectiveness of the proposed approach in producing rational and interpretable recommendations. By bridging the gap between theoretical MCDM models and practical tourism applications, this study offers insights into the development of transparent and efficient decision support tools. In conclusion, the implementation of a SAW-based DSS is expected to enhance decision quality, reduce subjectivity, and support tourists and stakeholders in selecting optimal tourism destinations in an increasingly complex information environment [10]–[12].

2. METHODELOGY

Recent studies have increasingly explored the application of Decision Support Systems (DSS) in tourism destination selection due to the inherently multi-criteria nature of the problem. Several researchers have formulated tourism recommendation and selection as a Multi-Criteria Decision Making (MCDM) task, where alternatives are evaluated based on quantitative and qualitative attributes such as cost, accessibility, attractiveness, safety, and available facilities. For instance, Susanto et al. proposed an MCDM-based DSS to rank tourism destinations using weighted criteria, demonstrating that structured decision models can reduce subjectivity compared to manual selection approaches [10]. However, their study primarily focused on ranking accuracy and did not provide an in-depth analysis of system transparency or user interaction aspects. Similarly, Kurniawan et al. implemented a web-based tourism DSS using the Simple Additive Weighting (SAW) method and reported improved decision consistency, yet their evaluation was limited to functional testing without comparative analysis against other MCDM techniques [12].

Beyond SAW-based approaches, other studies have investigated alternative MCDM methods such as Analytic Hierarchy Process (AHP), Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), and hybrid models. Lee and Chang compared multiple MCDM methods for service and option selection, concluding that while AHP provides strong hierarchical structuring, it suffers from scalability issues when the number of criteria increases, whereas SAW offers better computational efficiency and simplicity [7]. Wang et al. applied SAW in decision-making systems across different domains and emphasized its interpretability and low computational complexity, making it suitable for real-time or web-based DSS applications [8]. In the tourism context, Mangla et al. highlighted that complex MCDM models

may achieve higher theoretical robustness but often reduce usability and transparency for end users, which are critical factors in tourism decision-making systems [4].

More recently, research has shifted toward intelligent and explainable tourism decision support systems aligned with the smart tourism paradigm. Gretzel et al. emphasized that modern tourism systems should not only provide recommendations but also support user understanding of how decisions are derived [9]. Zhang and Zhang further argued that explainability is a key requirement for user trust in DSS, particularly in domains involving personal preferences and high decision impact [11]. Although explainable DSS frameworks have been widely discussed, their practical implementation in tourism destination selection remains limited. Most existing systems either rely on black-box recommendation models or do not explicitly address the transparency of the decision process.

Based on the reviewed literature, a clear research gap can be identified. While numerous studies have applied MCDM techniques to tourism destination selection, many lack a balanced focus on simplicity, transparency, and practical system implementation. SAW-based approaches show promise due to their interpretability and efficiency; however, prior works often provide limited evaluation or insufficient discussion of how SAW can be effectively integrated into a flexible DSS that accommodates user-defined preferences. Therefore, this study aims to address this gap by implementing and evaluating a SAW-based Decision Support System specifically designed for tourism destination selection, emphasizing both decision accuracy and system usability.

3.1. Research Object and Data Sources

The object of this research is a Decision Support System (DSS) designed to assist users in selecting optimal tourism destinations based on multiple evaluation criteria. The alternatives in this study consist of several tourism destinations that are considered feasible choices within a defined geographical or administrative region. The data used in this research are secondary and structured data obtained from official tourism information sources, local tourism offices, and publicly available tourism databases. These data represent quantitative and qualitative attributes of each tourism destination, such as entrance cost, accessibility, available facilities, safety level, and attractiveness. Each attribute corresponds to a decision criterion that reflects factors commonly considered by tourists when selecting destinations. The use of real-world tourism data ensures that the proposed system reflects practical decision-making conditions and supports meaningful evaluation of the decision model [10], [12].

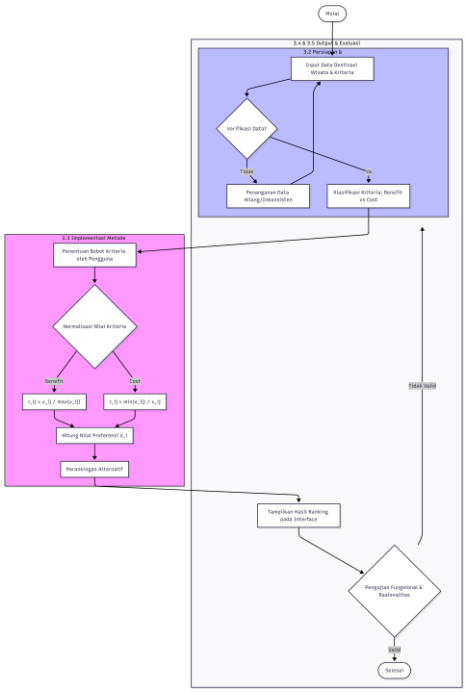


Figure 3.1. Workflow of the Decision Support System for Tourism Destination Selection Using the Simple Additive Weighting Method.

Figure 3.1 illustrates the complete workflow of the proposed Decision Support System (DSS) for tourism destination selection based on the Simple Additive Weighting (SAW) method, which integrates data preparation, decision modeling, result generation, and evaluation into a coherent process. The workflow begins with the system initialization, followed by the input of tourism destination data and evaluation criteria as decision alternatives and attributes. The system then performs a data verification stage to ensure the completeness and consistency of the input; invalid or inconsistent data are handled through a dedicated data correction process before proceeding further. Once the data are verified, each criterion is classified into benefit or cost types, which is a crucial step for applying the appropriate SAW normalization formulas. The decision-making phase continues with user-defined weighting of criteria, allowing flexibility and personalization according to user preferences. Subsequently, the system normalizes the criteria values, calculates the preference value for each alternative using a weighted summation, and produces a ranking of tourism destinations based on these values. The ranking results are then presented through the system interface to support user interpretation and comparison of alternatives. Finally, the workflow incorporates functional and rationality testing to evaluate whether the system operates as intended and whether the generated rankings are logically consistent with the input data and assigned weights. If the evaluation results are valid, the process concludes; otherwise, the system provides a feedback loop for data or parameter revision. Overall, the workflow demonstrates that the proposed DSS offers a structured, transparent, and systematic decision-making process that enhances the objectivity and reliability of tourism destination selection.

3.2. Data Preparation and Preprocessing

Prior to the decision-making process, data preparation and preprocessing are conducted to ensure consistency and comparability among criteria values. Since the criteria used in this research have different units and scales, normalization is required to transform raw data into dimensionless values within a common range. The criteria are classified into benefit criteria, where higher values are preferred, and cost criteria, where lower values are more desirable. This

classification is essential to apply the appropriate normalization formula in the SAW method. In addition, missing or inconsistent data are handled through verification against source records to maintain data integrity. This preprocessing stage plays a critical role in reducing bias and ensuring that the ranking results accurately represent the relative performance of each tourism destination [4], [8].

3.3. Proposed Decision Support Method Using SAW

The core method employed in this research is the Simple Additive Weighting (SAW) method, which is one of the most widely used techniques in Multi-Criteria Decision Making (MCDM) due to its simplicity and interpretability. The SAW method operates by calculating a weighted sum of normalized criteria values for each alternative. Let Let A_i denote the i-th tourism destination alternative and C_j denote the j-th evaluation criterion with weight w_j, where $\sum_{j=1}^{n} w_j =$. The normalized value r_{ij} is computed using the following equations:

For benefit criteria:

$$r_{ij} = \frac{x_{ij}}{\max(x_{ij})} \quad (1)$$

For cost criteria:

$$r_{ij} = \frac{\min(x_{ij})}{x_{ij}} \quad (2)$$

where x_{ij} represents the original value of alternative A_i on criterion C_j. After normalization, the final preference value V_i for each alternative is calculated as:

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

The alternatives are then ranked based on their preference values, with higher values indicating more favorable tourism destinations. This approach provides a transparent decision-making mechanism, allowing users to understand how each criterion contributes to the final ranking [7], [8].

3.4. Supporting Techniques and System Design

To enhance the flexibility and usability of the proposed DSS, user-defined weighting is incorporated into the system design. This allows users to adjust criterion weights according to personal preferences, travel objectives, or constraints, thereby increasing the system's adaptability. The DSS architecture consists of a data management module, a decision model module implementing the SAW algorithm, and a presentation layer that displays ranking results in a clear and interpretable format. Although the SAW method is mathematically simple, its integration into a DSS environment ensures systematic processing, repeatability, and reduced subjectivity in decision-making. This design choice aligns with prior research emphasizing the importance of transparency and user trust in decision support applications, particularly in tourism systems [9], [11].

3.5. System Evaluation and Testing

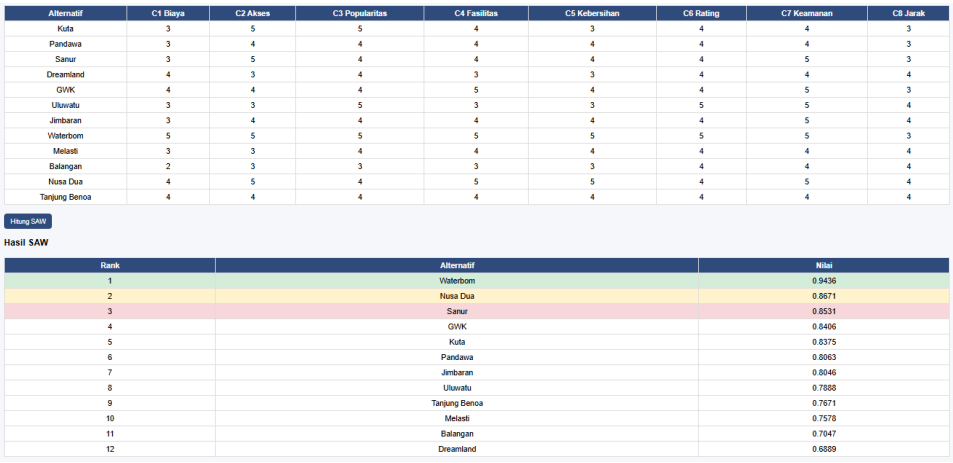
The evaluation of the proposed system is conducted through functional testing and result analysis using real tourism destination data. Functional testing ensures that each system component, including data input, normalization, weighting, and ranking, operates according to the designed workflow. In addition, the ranking results produced by the SAW-based DSS are

analyzed for consistency and rationality by examining whether destinations with superior criteria values obtain higher preference scores. This evaluation approach is consistent with prior DSS studies that focus on validating decision logic and usability rather than predictive accuracy [10], [12]. The evaluation results are expected to demonstrate that the proposed system effectively supports tourism destination selection and provides clear, explainable, and reliable recommendations.

4. RESULTS AND DISCUSSION

4.1 Analysis of SAW-Based Ranking Results

Figure 4.1 presents the input data matrix and the resulting ranking produced by the Simple Additive Weighting (SAW) method, which constitutes the main output of the proposed Decision Support System (DSS). The upper part of the figure shows the decision matrix containing twelve tourism destination alternatives evaluated across eight criteria, namely cost (C1), accessibility (C2), popularity (C3), facilities (C4), cleanliness (C5), rating (C6), security (C7), and distance (C8). Each criterion value represents a quantitative assessment derived from the prepared dataset, reflecting the relative performance of each destination. After applying criterion classification, normalization, and user-defined weighting as described in the methodology section, the SAW method computes a preference value for each alternative. The lower part of the figure displays the final ranking results, where destinations are ordered based on their preference values. The results indicate that Waterbom achieves the highest rank with a preference value of 0.9436, suggesting that it performs consistently well across most evaluation criteria, particularly facilities, cleanliness, rating, and security. Nusa Dua and Sanur follow in the second and third positions, respectively, reflecting strong overall performance with slightly lower aggregate scores. Conversely, destinations such as Balangan and Dreamland are ranked lower due to comparatively weaker scores on several criteria, which reduce their overall preference values despite strengths in specific aspects. These results demonstrate that the SAW-based DSS is capable of differentiating tourism destinations in a rational and transparent manner, producing rankings that are logically aligned with the input criteria values and their assigned weights. Overall, the analysis confirms that the proposed system effectively supports multi-criteria tourism destination selection and provides interpretable decision outcomes suitable for practical use.



Alternatif	C1 Biaya	C2 Akses	C3 Popularitas	C4 Fasilitas	C5 Kebersihan	C6 Rating	C7 Keamanan	C8 Jarak
Kuta	3	5	5	4	3	4	4	3
Pandawa	3	4	4	4	4	4	4	3
Sanur	3	5	4	4	4	4	5	3
Dreamland	4	3	4	3	3	4	4	4
GWK	4	4	4	5	4	4	5	3
Uluwatu	3	3	5	3	3	5	5	4
Jimbaran	3	4	4	4	4	4	5	4
Waterbom	5	5	5	5	5	5	5	3
Melasti	3	3	4	4	4	4	4	4
Balangan	2	3	3	3	3	4	4	4
Nusa Dua	4	5	4	5	5	4	5	4
Tanjung Benoa	4	4	4	4	4	4	4	4

Hitung SAW

Hasil SAW

Rank	Alternatif	Nilai
1	Waterbom	0.9436
2	Nusa Dua	0.8671
3	Sanur	0.8531
4	GWK	0.8406
5	Kuta	0.8375
6	Pandawa	0.8063
7	Jimbaran	0.8046
8	Uluwatu	0.7888
9	Tanjung Benoa	0.7671
10	Melasti	0.7578
11	Balangan	0.7047
12	Dreamland	0.6889

Figure 4.1. Decision matrix and SAW ranking results for tourism destination selection.

5. CONCLUSIONS

This research has presented the design and implementation of a Decision Support System (DSS) for tourism destination selection using the Simple Additive Weighting (SAW) method as the core multi-criteria decision-making approach. The proposed system was

developed to address the complexity of selecting tourism destinations when multiple and often conflicting criteria must be considered simultaneously. By integrating structured data preparation, criterion classification, normalization, user-defined weighting, and preference value computation, the DSS provides a transparent and systematic mechanism for ranking tourism destinations. The experimental results demonstrate that the SAW method is effective in producing rational and interpretable rankings, where destinations with stronger overall performance across key criteria achieve higher preference values. The implementation results confirm that the system can reduce subjectivity in decision-making and assist users in selecting tourism destinations more objectively and efficiently.

Despite the promising results, this study has several limitations that open opportunities for future work. Future research may explore the integration of hybrid or comparative Multi-Criteria Decision Making (MCDM) methods, such as AHP–SAW or SAW–TOPSIS, to further enhance decision robustness and comparative insight. In addition, incorporating dynamic or adaptive weighting mechanisms based on user behavior or contextual factors could improve personalization and recommendation quality. Further evaluation using larger and more diverse datasets, as well as usability testing involving real users, is also recommended to strengthen the generalizability and practical applicability of the system. These enhancements are expected to contribute to the development of more intelligent, flexible, and user-centered tourism decision support systems.

6. SUGGESTION

Based on the findings and limitations of this study, several directions can be suggested for future research to enhance the effectiveness and applicability of decision support systems for tourism destination selection. Future studies may consider incorporating advanced or hybrid Multi-Criteria Decision Making (MCDM) approaches, such as the integration of Simple Additive Weighting (SAW) with Analytic Hierarchy Process (AHP) or Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), in order to compare decision consistency and improve ranking robustness. In addition, the use of dynamic or context-aware weighting schemes that adapt to user preferences, travel objectives, or temporal factors could further increase personalization and decision accuracy. Future research is also encouraged to expand the dataset by including a larger number of tourism destinations and more diverse criteria, such as environmental sustainability and real-time visitor density, to improve system scalability and relevance. Moreover, conducting comprehensive usability and user experience evaluations involving actual tourists or stakeholders would provide deeper insights into system acceptance and practical effectiveness. These research directions are expected to support the development of more intelligent, adaptive, and user-centered tourism decision support systems.

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