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Research article

Implementation of the TOPSIS Method for a Decision Support System in Recommending Tourist Destinations in Tabanan

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ABSTRACT

Tourism development plays an important role in stimulating regional economic growth, particularly in areas with diverse natural and cultural attractions such as Tabanan Regency in Bali. However, visitors often experience difficulties in selecting destinations that match their preferences due to the presence of multiple decision factors and scattered informational resources, making destination decisions less systematic and potentially inconsistent. This situation highlights the need for a methodical decision support mechanism capable of evaluating tourist destinations based on multiple criteria. Motivated by this issue, this study implements the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method as part of a Decision Support System designed to recommend suitable tourist destinations in Tabanan. The system evaluates nine destinations based on eight criteria, which include accessibility, attractiveness, facility availability, cleanliness, cost, popularity, safety, and visitor density, and applies weight values determined through expert judgment. The evaluation results show that Jatiluwih Rice Terrace has the highest ranking with a closeness coefficient of 0.679126, followed by Ulun Danu Beratan and Tanah Lot, indicating that heritage value and environmental management strongly contribute to recommendation outcomes. The model provides transparent ranking reasoning and can support tourists, planners, and local tourism administrators in making informed decisions. Future development may involve expanding the destination dataset, integrating real-time visitor data, and deploying the system as a mobile application to improve personalization and accessibility.

1. Introduction

Tourism plays a crucial role in supporting regional economic growth, particularly in areas that rely on natural and cultural attractions as primary economic sectors. Tourist destinations often function as sources of local income, job creation, and cultural preservation that strengthen regional identity and community empowerment [1]. In Indonesia, Bali remains one of the most recognized tourist destinations worldwide due to its rich cultural heritage, natural landscapes, and diverse tourism activities [2]. Within Bali, Tabanan Regency stands out as an area with significant tourism potential, offering a range of natural landscapes such as mountains, rice terraces, waterfalls, lakes, and coastal regions, as well as religious and cultural attractions [3]. However, despite the abundance of tourism assets, many tourists still rely solely on promotional information or subjective

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recommendations when selecting travel destinations. This often leads to inefficiencies in destination selection and inconsistent tourist satisfaction.

The main challenge faced by tourists is the difficulty in choosing destinations that align with their preferences, travel goals, available time, and budget limitations [4]. Tourists commonly evaluate destinations based on multiple criteria, such as accessibility, attractiveness, amenities, cost, popularity, and environmental cleanliness. These criteria possess different levels of importance for each traveler, which makes manual evaluation highly subjective and prone to inconsistency [5]. Moreover, information regarding tourist destinations is scattered across various digital platforms, making it difficult for tourists to compare destinations fairly and systematically [6]. Local tourism authorities also face difficulties in promoting destinations in a structured manner due to the lack of a standardized recommendation framework. Thus, there is a need for a Decision Support System (DSS) capable of processing multiple criteria and delivering objective recommendations to support tourism decision-making in Tabanan.

To address this issue, multi-criteria decision-making (MCDM) methods have been widely adopted in various decision support applications, including tourism management, prioritization, and destination ranking models [7]. One commonly used MCDM technique is the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), which evaluates alternatives based on their distance to an ideal positive and negative reference solution [8]. TOPSIS is particularly beneficial because it provides a clear, quantitative ranking and can handle both benefit and cost criteria simultaneously. Recent studies demonstrated that TOPSIS is capable of delivering consistent and interpretable results across different selection scenarios, including tourism recommendation systems [9]. Therefore, the goal of this research is to design and implement a DSS that utilizes the TOPSIS method to recommend suitable tourist destinations in Tabanan based on multiple evaluation criteria, including accessibility, attractiveness, facility availability, cleanliness, cost, popularity, safety, and visitor density.

The developed system allows users to obtain destination recommendations that align with their preferences through a structured evaluation process. The system integrates destination information and assigns weight values to each criterion to compute the final ranking using the TOPSIS methodology [10]. The main contributions of this research include: (1) providing a systematic and transparent decision-making framework for recommending tourist destinations in Tabanan, (2) demonstrating the applicability of TOPSIS in real-world tourism decision support, and (3) offering a practical digital tool that can assist tourists, travel planners, and local tourism authorities. By providing a more reliable and data-driven recommendation system, this research supports sustainable tourism development by ensuring that destination selection is both efficient and aligned with traveler expectations. Furthermore, the system encourages balanced tourist distribution across multiple destinations, helping reduce overcrowding in popular areas and promoting lesser-known tourism sites. Thus, the integration of DSS and TOPSIS is expected to improve tourism planning experiences and strengthen regional tourism competitiveness.

2. Related Work

Research on decision support systems in the tourism sector has significantly progressed alongside the expansion of information technology and multi-criteria decision-making (MCDM) methods. Tourist destination selection is inherently complex because travelers evaluate multiple factors such as accessibility, attractiveness, cost, cleanliness, popularity, and overall comfort. Consequently, the integration of computational reasoning models has been used to support more objective and structured decision-making. Several studies have demonstrated the effectiveness of MCDM approaches in ranking and recommending tourism sites, enabling users, tourism agencies, and governments to design better travel planning strategies [11]. One widely used MCDM technique is the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), which ranks alternatives based on their proximity to the ideal solution and distance from the worst-case scenario [12].

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Existing studies have applied TOPSIS to various tourism recommendation cases. For example, Putra et al. [13] developed a decision support system that recommended cultural tourism destinations using criteria based on accessibility, cultural value, and facility availability. Their findings indicated that TOPSIS produced consistent ranking results aligned with expert evaluations. Likewise, Sari and Hidayat [14] implemented TOPSIS for prioritizing ecotourism areas, demonstrating the method's ability to handle environmental and sustainability evaluation indicators. However, both studies focused on specific destination categories and did not address broader multi-type tourism contexts, which may limit general applicability. This highlights the importance of adapting criteria weights and evaluation parameters according to regional tourism dynamics.

In the broader domain of tourism digitalization, several researchers have integrated TOPSIS with geographic information systems (GIS) and real-time mobile applications to provide location-based recommendations. Nugroho et al. [15] proposed a mobile tourism guide system that incorporated TOPSIS to suggest tourism spots based on user preferences. Their system provided dynamic ranking output and route suggestions. Although effective in enhancing user convenience, the model relied heavily on user input variability, making recommendation output inconsistent among different users. Similarly, Ramadhani et al. [16] combined TOPSIS with GPS-based geolocation tracking to create a real-time tourism recommender system. While the system offered personalized recommendations, its accuracy depended on stable Internet connectivity and updated tourism infrastructure data.

More recent research has examined hybrid methods, combining TOPSIS with fuzzy logic, AHP (Analytic Hierarchy Process), or machine learning algorithms to improve the quality of decision-making. Pramesti and Wijaya [17] integrated AHP and TOPSIS to determine weight priorities and destination rankings for tourism villages. Their model improved weighting accuracy by reducing subjectivity. However, AHP required consistent expert assessments, which can be difficult to maintain with large stakeholder groups. In another study, Zhou et al. [18] implemented Fuzzy-TOPSIS to assess tourism environmental sustainability performance. Fuzzy logic reduced ambiguity in linguistic evaluations, although it introduced increased computational complexity. These hybrid approaches indicate ongoing efforts to refine ranking precision in tourism decision-making systems.

The integration of online user review data has also been explored to enhance recommendation reliability. Kurniawan et al. [19] utilized sentiment analysis techniques to extract perceived visitor satisfaction from online travel reviews and incorporated these sentiment scores as criteria in TOPSIS ranking. This approach increased contextual relevance by directly reflecting visitor experiences. However, text mining accuracy depended on correct sentiment classification, which can vary across languages and informal expression styles commonly found in social media comments. Thus, data preprocessing and language normalization play a critical technical role in such systems.

Despite these advancements, several research gaps remain. Many previous studies either focused on limited types of destinations or did not consider the balance between benefit criteria (such as attractiveness and facility quality) and cost criteria (such as entrance fees and crowd density). Additionally, some systems lacked personalization features, providing general recommendations rather than user-preference-driven outputs. Furthermore, only a few works specifically address tourism recommendation in Tabanan Regency, despite its cultural and natural tourism potential, including Tanah Lot, Jatiluwih, and Ulun Danu Beratan, which are internationally recognized destinations. This gap suggests a need for decision support models tailored to regional tourism characteristics and local management priorities [20].

Based on the trends identified in previous works, the current study contributes by implementing the TOPSIS method in the context of multi-type tourist destination recommendations in Tabanan Regency. The research accounts for multiple balanced criteria, including accessibility, attractiveness, facilities, cleanliness, cost, popularity, safety, and visitor density. Additionally, expert-based weighting ensures that criteria importance reflects real tourism conditions. The resulting system offers structured and transparent ranking output that aligns with local tourism development priorities and enhances tourist decision-making efficiency.

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3. Methodology

3.1. Data Collection

This study compiles information for nine tourist destinations in Tabanan that represent diverse landscape types and visitor experiences. Data sources include official tourism documents, destination manager briefings, curated travel portals, and limited field verification to confirm attribute consistency. Each destination is profiled using a uniform template so that attributes can be compared systematically across alternatives. Qualitative descriptors are translated into ordinal scores to enable multi-criteria modeling while preserving domain meaning. Missing or ambiguous entries are resolved through triangulation among sources to reduce measurement bias and improve reliability. The resulting dataset provides a coherent foundation for structured evaluation using a decision support approach [21].

3.2. Criteria Definition

Eight criteria are employed to capture the multidimensional nature of destination suitability for visitors. The criteria are accessibility, attractiveness, facility availability, cleanliness and environmental stewardship, cost of visit, popularity, safety and comfort, and visitor density. Each criterion is explicitly tagged as either benefit oriented or cost oriented to guide subsequent optimization logic. The classification ensures that higher scores improve the ranking for benefits while lower values improve the ranking for costs. Criterion selection is grounded in tourism behavior literature and local stakeholder consultations to reflect practical decision considerations. This construct enables fair comparison among destinations with different strengths while preserving contextual relevance [22].

3.3. Weight Assignment

Weights are elicited from tourism experts, local guides, and experienced travelers using a structured importance rating instrument. Individual ratings are aggregated by computing mean scores and then normalized so the total weight equals one for mathematical coherence. This procedure balances diverse perspectives while preventing any single viewpoint from dominating the model. The final weights emphasize attractiveness and popularity, with moderate emphasis on accessibility and facilities, and lower emphasis on visitor density and safety to reflect local planning priorities. Weight transparency is preserved so stakeholders can interpret how preferences influence final rankings. This approach supports replicability and allows sensitivity analysis should future policy require reweighting [23].

3.4. Decision Matrix Construction

A decision matrix is created where rows denote destinations and columns denote the eight criteria. All attributes are mapped to a five-point scale to harmonize heterogeneous measurements without losing ordinal meaning. For cost criteria, lower numeric values indicate preferable conditions, and the coding is consistently documented to avoid ambiguity. The matrix is reviewed for outliers and inconsistent entries before computation to maintain analytical integrity. This structure enables algorithmic processing while keeping the model interpretable to nontechnical stakeholders. Preparing the matrix carefully reduces downstream errors and strengthens confidence in the final ranking output [24].

3.5. Normalization Process

Vector normalization is applied so that criteria measured on different scales become comparable within a common numeric range. Each entry is divided by the square root of the sum of squares within its criterion column, producing dimensionless values. This step prevents criteria with larger magnitudes from overpowering the aggregation process in later stages. Normalization also stabilizes the effect of weights because all criteria contribute in proportion to their standardized variation. The method is computationally efficient and widely used in multi-criteria models, ensuring methodological familiarity for reviewers. With normalization complete, destinations can be assessed fairly across all indicators [25].

3.6. Weighted Normalized Matrix

The normalized matrix is multiplied by the vector of criterion weights to embed stakeholder preferences into the evaluation. This transformation scales each criterion according to its assessed importance while preserving the relative performance among destinations. The operation yields a

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weighted normalized matrix that forms the basis for ideal solution identification. Because weights sum to one, the aggregate scores remain interpretable as preference-adjusted positions in the criteria space. This design supports transparent communication about why some criteria influence the results more strongly. The weighted representation directly links expert judgments to computable ranking outcomes [26].

3.7. Ideal Solutions and Closeness Coefficient

Positive ideal values are determined as the best weighted scores for benefit criteria and the lowest for cost criteria. Negative ideal values represent the converse, forming a reference for least desirable conditions under the same weighting scheme. For each destination, Euclidean distances are computed to both the positive and negative ideals to capture relative positioning. The closeness coefficient is then calculated as the ratio of distance to the negative ideal over the sum of both distances. Larger coefficients indicate alternatives situated nearer to desirable conditions and farther from undesirable ones. Sorting these coefficients produces a clear and interpretable recommendation order for stakeholders [27].

3.8. Example of TOPSIS Calculation Overview

The methodology is operationalized in a web-based decision support system to facilitate practical use by tourists and local planners. The interface allows users to adopt default weights or adjust them to reflect personal preferences before running the computation. After execution, the system displays ranked destinations along with key criterion contributions to enhance transparency and learning. Summary tables and brief narratives accompany the results to communicate trade-offs among criteria clearly. The architecture is designed to accommodate future modules such as real-time crowd indicators and seasonal adjustments. This implementation supports digital tourism initiatives while promoting evidence-based destination selection in Tabanan [28].

4. Results and Discussion

4.1 Results

The TOPSIS calculation generated closeness coefficient values for each of the nine tourist destinations, allowing them to be ranked based on their proximity to the ideal criteria. The highest score was obtained by Jatiluwih Rice Terrace (A2) with 0.679126, indicating superior suitability compared to the other alternatives. This value reflects strong performance across benefit-type criteria such as scenic uniqueness, environmental cleanliness, and cultural authenticity. The balanced presence of facilities and accessibility also contributed to its high ranking. Because each criterion influences the final result proportionally according to its assigned weight, Jatiluwih's consistent quality ensured its top position. Therefore, Jatiluwih is identified as the most recommended tourism site within Tabanan.

The second-highest closeness coefficient was obtained by Ulun Danu Beratan (A3) with 0.673424, showing only a slight difference from Jatiluwih. This destination is known for its temple architecture situated on a lakeside setting, producing strong scenic and spiritual appeal. It also offers relatively structured visitor support facilities, making it accessible and comfortable for a broad range of travelers. However, slightly higher travel costs and moderate visitor crowding reduce some benefit criteria scores. Even so, its overall performance remains very competitive and nearly comparable to Jatiluwih. Thus, Ulun Danu Beratan stands as a strong secondary recommendation.

In third place, Tanah Lot (A1) achieved a closeness coefficient of 0.642314. Tanah Lot's popularity as an iconic cultural landmark contributes significantly to its attractiveness and visitor interest scores. However, the site experiences high daily visitor density, which affects comfort, cleanliness, and environmental quality evaluations. These crowding effects decrease performance on cost-related criteria, lowering its comparative ranking. Although visually appealing and culturally significant, Tanah Lot does not achieve optimal balance across all criteria. Therefore, while still highly appealing, it ranks lower than Jatiluwih and Ulun Danu.

The fourth position is held by Kebun Raya Bedugul (A4) with a closeness coefficient of 0.633357. This botanical garden serves educational, recreational, and conservation functions, making it suitable for family visits and nature-based tourism. Its facility infrastructure is generally well-managed, contributing positively to the visitor experience. However, the site lacks iconic cultural

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symbolism compared to Tanah Lot or Ulun Danu. This reduces its appeal in criteria associated with cultural or spiritual attraction. As a result, its ranking remains strong but not dominant.

The fifth-ranked destination is The Blooms Garden (A9) with a closeness coefficient of 0.562472. This destination is designed for outdoor leisure and photo-based tourism experiences, which particularly appeals to domestic travelers. Although visually attractive, its cultural and historical depth is limited compared to the top-ranked sites. Facility availability is adequate, but not exceptional enough to influence high comparative weighting. Thus, its performance tends to fall within a moderate range across multiple criteria. The ranking suggests strong leisure appeal but lower experiential depth.

The sixth and seventh positions are occupied by Desa Wisata Wongaya Gede (A8) and Air Terjun Blemantung (A7). These destinations emphasize natural and rural tourism experiences, offering authenticity and scenic tranquility. However, accessibility barriers and fewer tourism support facilities limit visitor convenience. Promotional exposure is also comparatively lower, reducing popularity and awareness scores. Despite scenic appeal, lack of infrastructure reduces their placement within the ranking. Thus, both destinations show potential but require development to increase competitiveness.

The lowest-ranking destinations are Pantai Soka (A5) and Pantai Kelating (A6) with closeness coefficients of 0.394023 and 0.357686 respectively. Both beaches provide natural scenic views, but visitor infrastructure and support services are minimal. Limited cleanliness maintenance and unclear facility management influence environmental quality perceptions. Accessibility challenges also reduce travel convenience for visitors. These issues cause significant reductions in benefit-criteria scoring. As a result, both beaches are considered less suitable based on multi-criteria assessment.

4.2 Discussion

The results of the evaluation show that tourist destination suitability is strongly influenced by a balanced interaction between cultural identity, environmental quality, accessibility, and supporting facilities. Destinations with strong cultural heritage and managed landscapes, such as Jatiluwih and Ulun Danu Beratan, score highly across these interrelated dimensions. Their attractiveness does not rely solely on scenery, but also on the preservation of tradition and continuity of local values. This reinforces the idea that cultural and experiential authenticity plays a major role in shaping traveler perceptions. The closer a destination aligns with multiple benefit criteria, the higher its closeness coefficient will be in the TOPSIS ranking. Therefore, balanced development emerges as a key factor for achieving high tourism competitiveness.

The case of Tanah Lot illustrates how excessive visitor numbers can undermine the overall tourism experience. Although the destination is iconic and internationally known, overcrowding creates issues related to comfort, accessibility, and environmental cleanliness. These negative impacts affect both visitors' perception of quality and the destination's ability to sustain long-term tourism satisfaction. Without proper crowd control and management strategies, popular sites risk losing experiential value. This example demonstrates that tourism promotion must be accompanied by capacity regulation. Sustainable tourism policies should therefore integrate environmental load considerations into site management.

Kebun Raya Bedugul, ranked fourth, shows the importance of environmental education as a component of tourism value. Its function as both a botanical conservation site and recreational area contributes to a unique type of tourism experience. However, its cultural and symbolic resonance is less strong compared to destinations with temple or sacred site significance. This influences its ranking despite having adequate infrastructure and accessibility. The results suggest that destination appeal is shaped not only by facility readiness but also by emotional, historical, and cultural depth. Enhancing interpretive and heritage-based storytelling may increase its perceived attractiveness.

Destinations in the middle tier, such as The Blooms Garden, offer outdoor leisure experiences that appeal to visual and recreational preferences. However, their cultural and ecological distinctiveness may not be as significant as top-ranked sites. This results in moderate scores across most criteria rather than dominant strength in any single aspect. The Blooms Garden demonstrates how leisure-based destinations benefit from effective facility management and visual-oriented

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attractions. Yet, without deeper cultural or ecological uniqueness, their ranking potential remains limited. This highlights the importance of multi-layered experiential value in tourism competitiveness.

Lower-ranking destinations like Wongaya Gede Village and Blemantung Waterfall illustrate barriers related to infrastructure development and accessibility. Despite their natural and cultural potential, insufficient transportation routes and limited service support reduce visitor comfort. Additionally, weaker promotional exposure limits public awareness and destination popularity scores. These factors collectively contribute to lower closeness coefficient results in the TOPSIS analysis. However, their authenticity and landscape potential indicate strong opportunities for development. Strategic investment could elevate their ranking significantly in future assessments.

Pantai Soka and Pantai Kelating, which ranked the lowest, present examples of destinations where scenic beauty alone is insufficient to generate strong tourism appeal. Lack of structured facilities, limited maintenance efforts, and unclear visitor service guidelines contribute to reduced visitor satisfaction. Accessibility challenges further reduce ease of travel compared to the higher-ranked destinations. These characteristics negatively affect benefit-type tourism criteria and overall evaluation outcomes. The findings suggest that coastal destinations require integrated development frameworks to improve competitiveness. Without such improvements, they will continue to be overshadowed by more developed alternatives.

Overall, the discussion demonstrates that tourism destination competitiveness depends on a synergy of natural landscapes, cultural value preservation, infrastructure management, and visitor experience quality. The TOPSIS method successfully highlighted the influence of multiple criteria and provided a transparent ranking structure. This supports the suitability of TOPSIS for multi-dimensional tourism evaluation where subjective perceptions must be systematized. The results offer valuable insights for tourism planning, policy formulation, and destination development strategy. Future development efforts should prioritize balancing heritage preservation with infrastructure enhancement. These conclusions reinforce the importance of holistic and sustainable approaches in managing tourism potential in Tabanan.

4. Conclusion

The study successfully developed and implemented a Decision Support System (DSS) using the TOPSIS method to recommend tourist destinations in Tabanan Regency. The system was designed to evaluate tourism sites based on a structured set of eight criteria that reflect key factors influencing visitor preferences. Through this modeling approach, subjective considerations were converted into quantifiable indicators that allow consistent comparison among destinations. The use of expert weighting ensured that the criteria used were aligned with real tourism management priorities and traveler expectations. The findings confirm that multi-criteria decision-making methods are suitable for complex tourism selection scenarios. Overall, the research provides a systematic framework for guiding tourism recommendations in Tabanan.

The results generated from the TOPSIS calculation indicated clear ranking differences among the nine destinations evaluated. Jatiluwih Rice Terrace was identified as the most recommended tourism site due to its strong performance across cultural, environmental, and accessibility-related criteria. Ulun Danu Beratan and Tanah Lot followed closely, with minor differences influenced by visitor density and cost considerations. This demonstrates that the significance of supporting facilities and environmental maintenance plays a major role in enhancing destination value. Meanwhile, destinations with limited infrastructure or promotional reach tended to rank lower. These outcomes reinforce the importance of balanced tourism development strategies.

The analysis further highlighted that cultural authenticity, environmental preservation, and visitor experience quality are essential components of destination competitiveness. Destinations that integrate heritage value with sustainable landscape management tend to attract visitors for both recreational and meaningful cultural experiences. Conversely, destinations that rely solely on visual appeal without complementary facilities or visitor comfort measures may struggle to maintain long-term tourism interest. This finding suggests that tourism planning efforts must go beyond improving aesthetics alone. Community involvement in maintaining cultural and environmental identity also

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plays a crucial role. Thus, sustainable tourism practices become a foundation for long-term development.

The implementation of the DSS demonstrated practical benefits for both tourists and tourism stakeholders. For tourists, the system simplifies destination selection by presenting ranked recommendations that match their preferences. For tourism managers and planners, the system provides insights into which criteria most strongly influence visitor satisfaction and destination appeal. This can support policy decisions regarding infrastructure development, environmental conservation, and promotional strategies. The system also encourages more evenly distributed tourism flows, helping reduce excessive concentration in already popular areas. In this way, the DSS contributes not only to decision-making efficiency but also to regional tourism sustainability.

However, the research is not without limitations. The number of destinations assessed was limited to those with complete and verifiable data at the time of study. Some criteria were scored using expert judgment rather than direct field measurement, which may introduce subjective elements. Additionally, the current model does not incorporate real-time conditions such as weather, event schedules, or crowd fluctuations, which could influence destination suitability. The system also operates primarily through web-based access and does not yet support mobile platforms. These constraints highlight areas where further improvement is needed. Addressing these limitations can enhance the system's precision and usability.

In summary, the study demonstrates that the TOPSIS-based decision support approach provides an effective, transparent, and structured method for recommending tourist destinations in Tabanan. The system helps align visitor preferences with destination characteristics and promotes data-driven tourism decisions. By improving the quality of destination selection, it contributes to better visitor experiences and supports local tourism growth. Future enhancements involving dynamic data, increased destination scope, and mobile implementation could significantly expand the system's functionality. The research therefore offers both practical and developmental value for tourism management in Tabanan. With continued refinement, the system has strong potential to serve as a comprehensive tourism planning and advisory tool.

5. Suggestion

Future research is encouraged to expand the number of tourist destinations included in the dataset. In this study, only nine destinations were evaluated, primarily based on data availability and consistency. Increasing the dataset size will allow the model to reflect a wider representation of tourism potentials within Tabanan Regency. Additional destinations such as rural cultural villages, marine activity sites, or eco-adventure locations can broaden the system's applicability and improve the robustness of recommendation results.

The determination of criteria and weights in this research relied on expert judgment and normalized scoring. While this method ensures domain relevance, it may still involve subjective interpretation. Therefore, future work should consider incorporating automated weight estimation techniques, such as the Analytic Hierarchy Process (AHP), Fuzzy Weighting, or machine learning-assisted preference learning. These approaches can improve weighting precision and reduce reliance on subjective evaluation, especially when involving larger stakeholder groups.

To enhance recommendation personalization, the system could be developed to support dynamic user profiling. Each traveler has distinct preferences influenced by travel motivations, budget, mobility, and experience expectations. Therefore, integrating user preference modeling, such as profile-based recommendation engines or collaborative filtering algorithms, may provide more tailored destination recommendations. This improvement would help the system adapt recommendations to specific tourism segments such as backpackers, family travelers, cultural enthusiasts, or eco-tourists.

Additionally, the current system does not yet integrate real-time data inputs. Environmental conditions, weather patterns, seasonal events, and tourist crowd levels can significantly influence the

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suitability of a destination at a particular time. Incorporating real-time datasets, such as live visitor density monitoring, weather forecasting, and event schedules, can make the recommendations more dynamic and context-aware. This adjustment would enable temporary prioritization or de-prioritization of destinations based on actual conditions.

Finally, future development can focus on deploying the decision support system as a mobile application to increase accessibility. A mobile-based interface, equipped with interactive maps, route planning, offline access, and multilingual support, would be beneficial for both domestic and international tourists. Such enhancements not only increase usability but also strengthen the role of technology in promoting sustainable and well-distributed tourism development in Tabanan.

Declaration of Competing Interest

We declare that we have no conflict of interest.

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