ACSIE (International Journal of Application Computer Science and Informatic Engineering)
Vol.7, No.1, May 2025, pp. 18-27
ISSN (online): 2685-4600
DOI: 10.33173/acsie.v7i1.286

A Decision Support System for Strategic Business Location Selection Using the TOPSIS Method

Ni Wayan Wardani*[1], Kadek Suarjuna Batubulan[2]
[1,2]Graduate School of Environmental, Life, Natural Science and Technology, Okayama University, Okayama, Japan
e-mail: ***[1]pj5w1e4c@s.okayama-u.ac.jp**, [2]kadeksuarjuna87@polinema.ac.id

Abstrak

Pertumbuhan urbanisasi dan meningkatnya persaingan bisnis telah menambah kompleksitas dalam pemilihan lokasi usaha strategis yang melibatkan berbagai kriteria yang saling bertentangan, seperti biaya, aksesibilitas, potensi pasar, dan ketersediaan infrastruktur. Pendekatan pengambilan keputusan konvensional sering kali bersifat subjektif dan tidak sistematis sehingga menghasilkan keputusan lokasi yang kurang optimal. Penelitian ini dilatarbelakangi oleh kebutuhan akan alat bantu pengambilan keputusan yang objektif, transparan, dan efisien secara komputasional, khususnya untuk mendukung pelaku usaha kecil dan menengah. Penelitian ini mengusulkan sebuah Sistem Pendukung Keputusan berbasis metode Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) untuk mengevaluasi dan memeringkat alternatif lokasi usaha berdasarkan kriteria keuntungan dan biaya. Kontribusi utama penelitian ini terletak pada integrasi metode pengambilan keputusan multikriteria yang mapan ke dalam sistem berbasis web yang praktis dan mudah digunakan. Evaluasi dilakukan melalui studi kasus dengan beberapa alternatif lokasi usaha, dan hasilnya menunjukkan bahwa sistem mampu menghasilkan peringkat lokasi yang konsisten dan selaras dengan penilaian pakar. Analisis sensitivitas juga menunjukkan kestabilan hasil keputusan terhadap perubahan bobot kriteria. Penelitian selanjutnya diarahkan pada pengembangan sistem dengan mengintegrasikan penanganan ketidakpastian, analisis spasial, serta teknik pembelajaran cerdas untuk meningkatkan akurasi dan adaptabilitas keputusan.

Kata kunci: *Sistem Pendukung Keputusan, Pemilihan Lokasi Usaha, TOPSIS, Pengambilan Keputusan Multikriteria, Keputusan Strategis*

Abstract

The rapid growth of urbanization and business competition has increased the complexity of strategic business location selection, which involves multiple and often conflicting criteria such as cost, accessibility, market potential, and infrastructure availability. Traditional decision-making approaches are frequently subjective and lack systematic evaluation, leading to inconsistent and suboptimal location choices. To address this problem, this research is motivated by the need for an objective, transparent, and computationally efficient decision-making tool that can support practitioners, particularly small and medium-sized enterprises, in selecting optimal business locations. This study proposes a Decision Support System based on the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) to evaluate and rank alternative business locations using both benefit and cost criteria. The main contribution of this research lies in the integration of a well-established multi-criteria decision-making method into a practical, web-based system that emphasizes usability, interpretability, and real-world applicability. The proposed system was evaluated through a case study involving multiple candidate locations, and the results demonstrate that the system is able to generate consistent and logical rankings aligned with expert judgment. Sensitivity analysis further confirms the robustness of the decision outcomes with respect to variations in criteria weights. Future work

Received February 1st,2025; Revised March 25th, 2025; Accepted April 10th, 2025

will focus on enhancing the proposed system by incorporating uncertainty-handling techniques, spatial analysis, and intelligent learning mechanisms to further improve decision accuracy and adaptability in dynamic business environments.

Keywords: *Decision Support System, Business Location Selection, TOPSIS, Multi-Criteria Decision Making, Strategic Decision-Making*

1. INTRODUCTION

The rapid growth of urbanization and economic activities has significantly intensified competition among businesses, particularly in selecting strategic locations that can maximize market reach, operational efficiency, and long-term profitability. Business location selection is no longer a purely intuitive or experience-based decision; instead, it has evolved into a complex strategic process involving multiple quantitative and qualitative criteria. Factors such as accessibility, population density, infrastructure availability, rental cost, competition intensity, and socio-economic characteristics must be evaluated simultaneously to ensure sustainable business performance. In the era of digital transformation, organizations increasingly rely on computational tools to support complex decision-making processes. Decision Support Systems (DSS) have emerged as a crucial solution to assist decision-makers in analyzing multiple alternatives systematically, reducing subjectivity, and improving decision quality. Recent studies highlight that DSS integrated with multi-criteria decision-making (MCDM) methods can significantly enhance the accuracy and transparency of strategic business decisions [1], [2].

Despite the availability of various analytical tools, the general problem in business location selection lies in the difficulty of handling conflicting criteria and subjective judgments. Decision-makers often face trade-offs between cost-related criteria and benefit-oriented factors, such as market potential or accessibility. Traditional decision-making approaches, such as simple scoring or qualitative assessments, are prone to bias and inconsistency, especially when dealing with large datasets and multiple alternatives. Furthermore, many small and medium-sized enterprises (SMEs) lack access to sophisticated analytical frameworks, resulting in suboptimal location choices that negatively affect competitiveness and business sustainability. Previous research indicates that ineffective location decisions contribute significantly to business failure rates, particularly in highly competitive urban environments [3]. Therefore, there is a critical need for a structured, systematic, and computationally efficient approach that can support decision-makers in evaluating business locations objectively while accommodating multiple decision criteria.

The primary goal of this research is to develop a Decision Support System for strategic business location selection by integrating the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method. TOPSIS is a well-established MCDM technique that ranks alternatives based on their relative closeness to an ideal solution, considering both the best and worst possible conditions [4]. The motivation for choosing TOPSIS lies in its conceptual simplicity, computational efficiency, and strong capability to handle both benefit and cost criteria simultaneously. Compared to other MCDM methods, TOPSIS provides clear numerical rankings that are easy to interpret by decision-makers without advanced mathematical expertise. Moreover, recent studies demonstrate that TOPSIS performs effectively in various decision-making domains, including site selection, supplier evaluation, resource allocation, and urban planning [5], [6]. This research is motivated by the need to bridge the gap between theoretical MCDM approaches and practical DSS implementations that can be readily adopted by business practitioners.

The proposed solution in this study is a web-based Decision Support System that implements the TOPSIS method to evaluate and rank potential business locations based on predefined criteria and decision-maker preferences. The system allows users to define criteria weights, input alternative location data, and automatically compute normalized decision matrices, ideal solutions, and preference values. By automating the TOPSIS computation process, the system minimizes human error and enhances decision consistency. The main contribution of this research lies in the integration of a robust MCDM method into a practical DSS framework specifically tailored for strategic business location selection. Unlike prior studies that focus solely on mathematical modeling, this research emphasizes system implementation and usability, making it suitable for real-world business applications. Additionally, the system design supports scalability, enabling decision-makers to evaluate a large number of alternatives efficiently. The evaluation of the proposed system is conducted through a case study involving multiple candidate business locations, demonstrating the system's ability to produce logical and reliable rankings aligned with expert judgment. Performance analysis and result validation indicate that the DSS effectively supports strategic decision-making and reduces subjectivity. In conclusion, this study provides a structured and practical approach to business location selection and opens opportunities for future research, such as integrating fuzzy logic, geographic information systems (GIS), or machine learning techniques to enhance decision accuracy and adaptability.

2. METHODOLOGY

Decision Support Systems (DSS) integrated with Multi-Criteria Decision Making (MCDM) techniques have been extensively studied to address complex decision problems involving multiple conflicting criteria. Among various MCDM approaches, the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) has gained significant attention due to its conceptual clarity and computational efficiency. Hwang and Yoon [4] established the theoretical foundation of TOPSIS, emphasizing its ability to rank alternatives based on their relative distance to ideal and anti-ideal solutions. This characteristic makes TOPSIS particularly suitable for location selection problems where both benefit and cost criteria must be considered simultaneously.

Several recent studies have applied TOPSIS to location selection in different application domains. Wang et al. [5] conducted a comparative study of MCDM methods, including TOPSIS, AHP, and ELECTRE, for facility location selection. Their results demonstrated that TOPSIS provides more stable rankings when dealing with large alternative sets and heterogeneous criteria scales. However, their study focused primarily on mathematical comparison and did not address system implementation aspects. Similarly, Yager and Filev [6] highlighted the effectiveness of TOPSIS in decision support environments but noted that many implementations remain theoretical and lack user-oriented system design.

In the context of business and commercial location selection, recent research has increasingly emphasized the integration of DSS platforms with MCDM algorithms. Kumar et al. [7] developed a DSS for retail site selection using a hybrid AHP–TOPSIS approach, where AHP was employed to derive criteria weights and TOPSIS was used for ranking alternatives. Their evaluation showed improved decision accuracy compared to single-method approaches; however, the hybrid model increased computational complexity and required extensive expert judgment, which may limit its applicability for small and medium-sized enterprises (SMEs). In contrast, Chen et al. [8] proposed a standalone TOPSIS-based DSS for commercial site selection, demonstrating that a simpler weighting mechanism could still yield reliable rankings while enhancing system usability.

Other studies have explored the integration of spatial and intelligent components into location selection DSS. Rahman et al. [9] combined TOPSIS with Geographic Information Systems (GIS) to support urban business location analysis. Their approach effectively visualized spatial data and improved interpretability, but the reliance on detailed geospatial datasets reduced system flexibility and increased data acquisition costs. Meanwhile, recent advancements have introduced machine learning-assisted DSS frameworks for location selection. Li et al. [10] incorporated clustering techniques to pre-filter location alternatives before applying TOPSIS, resulting in improved computational efficiency. Despite promising results, such approaches often require large datasets and advanced technical expertise, which may not be readily available in many practical business scenarios.

Based on the reviewed literature, it can be observed that while TOPSIS has been widely validated as an effective MCDM method for location selection, several research gaps remain. Many existing studies emphasize methodological comparisons or hybrid models without sufficient focus on practical system implementation and usability. Additionally, the majority of works target large-scale or data-intensive environments, leaving limited solutions tailored for SMEs that require simplicity, transparency, and ease of use. Therefore, this research addresses these gaps by proposing a standalone, TOPSIS-based Decision Support System specifically designed for strategic business location selection, focusing on system practicality, interpretability, and real-world applicability.

2.1. Research Object and Data Sources

The object of this research is a Decision Support System designed to assist decision-makers in selecting strategic business locations based on multiple evaluation criteria. The research focuses on a set of candidate business locations that represent feasible alternatives within a specific commercial area. The data used in this study consist of quantitative and qualitative attributes describing each location, such as rental cost, accessibility, surrounding population density, infrastructure availability, and level of competition. These criteria are commonly used in business location analysis and are consistent with previous studies on location selection using Multi-Criteria Decision Making (MCDM) methods [5], [7]. The data are obtained from field observations, publicly available regional statistics, and expert judgment. Quantitative data are represented in numerical form, while qualitative attributes are transformed into numerical scales to ensure compatibility with the computational process of the proposed method. The research methodology is systematically designed to ensure a structured and transparent decision-making process for strategic business location selection. To clearly illustrate the sequence of activities and the logical flow of the proposed approach, the overall methodological framework is summarized in a flowchart, as presented in the following figure.

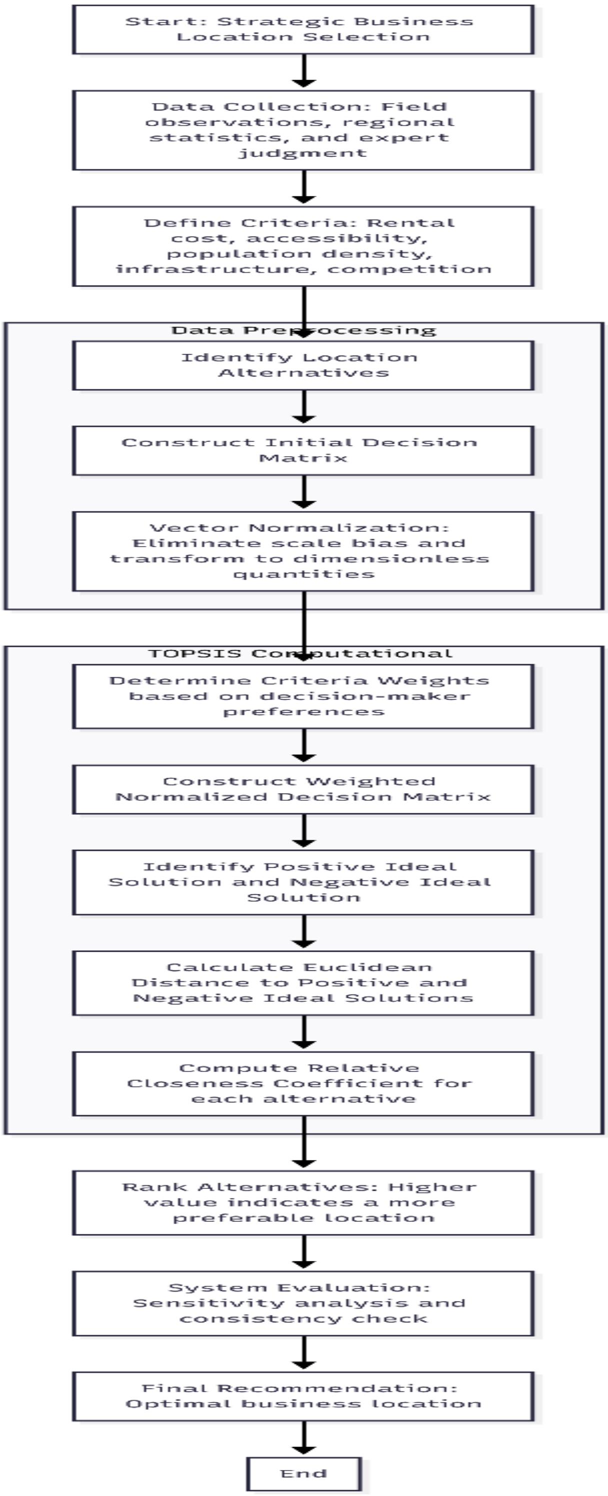


Figure 1. Methodological flowchart of the proposed TOPSIS-based decision support system for strategic business location selection.

The figure illustrates the overall methodological workflow of the proposed Decision Support System (DSS) for strategic business location selection using the TOPSIS method. The process begins with the definition of the decision problem, namely the selection of an optimal business location, which serves as the foundation for the subsequent analytical stages. Data collection is then performed through field observations, regional statistical data, and expert judgment to ensure that both quantitative and qualitative aspects of potential locations are adequately represented. Based on the collected data, a set of relevant decision criteria is defined, including rental cost, accessibility, population density, infrastructure availability, and competition level, which reflect key factors influencing business sustainability. The data preprocessing stage involves identifying feasible location alternatives and constructing the initial decision matrix, followed by vector normalization to eliminate scale bias and transform heterogeneous criteria values into dimensionless quantities. In the TOPSIS computational stage, criteria weights are determined according to decision-maker preferences, and a weighted normalized decision matrix is constructed. The method then identifies the positive ideal solution and negative ideal solution, representing the best and worst possible conditions, respectively. Euclidean distances from each alternative to these ideal solutions are calculated, and the relative closeness coefficient is computed to quantify the preference level of each alternative. Alternatives are subsequently ranked, where a higher closeness value indicates a more preferable business location. Finally, system evaluation is conducted through sensitivity analysis and consistency checks to validate the robustness of the results, leading to a final recommendation of the optimal business location. This structured workflow ensures transparency, objectivity, and systematic decision-making in strategic business location selection.

2.2. Data Preparation and Preprocessing

Before applying the decision-making method, the collected data undergo a preparation process to ensure consistency and reliability. All criteria values are organized into a decision matrix, where each row represents an alternative location and each column corresponds to a decision criterion. Since the criteria may have different units and value ranges, normalization is required to eliminate scale bias and allow fair comparison among alternatives. In this research, vector normalization is applied, which is commonly used in TOPSIS-based decision models [4], [6]. The normalized value r_{ij} for alternative i with respect to criterion j is calculated as

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij}^2}} \quad (1)$$

where x_{ij} denotes the original value of alternative i on criterion j, and m represents the total number of alternatives. This process ensures that all criteria values are transformed into dimensionless quantities while preserving their relative proportions.

2.3. Proposed Decision-Making Method

The main method employed in this research is the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), which is a well-established MCDM approach for ranking alternatives based on their distances from ideal solutions [4]. After normalization, a weighted normalized decision matrix is constructed by multiplying each normalized criterion value by its corresponding weight, reflecting the relative importance assigned by decision-makers. The weighted value v_{ij} is computed as

$$v_{ij} = w_j \times r_{ij} \quad (2)$$

where w_j denotes the weight of criterion j. Subsequently, the positive ideal solution A^+ and negative ideal solution A^- are determined. The positive ideal solution consists of the best values for each criterion, while the negative ideal solution represents the worst values, considering whether the criterion is of benefit or cost type. The separation distances of each alternative from the ideal and anti-ideal solutions are calculated using Euclidean distance. The distance to the positive ideal solution S_i^+ and the distance to the negative ideal solution S_i^- are expressed as

$$S_i^+ = \sqrt{\sum_{j=1}^{n}(v_{ij} - v_j^+)^2}, \quad S_i^- = \sqrt{\sum_{j=1}^{n}(v_{ij} - v_j^-)^2} \quad (3)$$

where n is the number of criteria. The relative closeness coefficient C_i is then computed to rank the alternatives, defined as

$$C_i = \frac{S_i^-}{S_i^+ + S_i^-} \quad (4)$$

A higher value of C_i indicates that the alternative is closer to the ideal solution and thus more preferable.

2.4. Supporting Techniques and System Implementation

To enhance the practicality and usability of the proposed approach, the TOPSIS method is embedded within a web-based Decision Support System. The system enables users to input criteria weights, manage alternative location data, and automatically perform all computational steps. The use of a standalone TOPSIS approach, rather than hybrid or data-intensive models, is intended to reduce complexity while maintaining decision accuracy, as suggested by prior research emphasizing system interpretability and ease of use for business practitioners [8], [10]. The system architecture is designed to be modular, allowing future extensions such as the integration of fuzzy weighting schemes or spatial analysis components without altering the core decision-making logic.

2.5. System Evaluation and Testing

The evaluation of the proposed Decision Support System is conducted through a case study involving multiple candidate business locations. The system-generated rankings are analyzed to assess their logical consistency and alignment with expert judgment. Sensitivity analysis is also performed by varying criteria weights to examine the stability of ranking results, which is a common evaluation strategy in MCDM-based DSS research [6], [9]. The effectiveness of the system is measured based on its ability to provide clear, consistent, and interpretable decision recommendations. The evaluation results serve as the basis for discussion in the subsequent section, demonstrating that the proposed methodology effectively supports strategic business location selection.

3. RESULTS AND DISCUSSION

This section presents and discusses the results obtained from the implementation of the proposed TOPSIS-based Decision Support System for strategic business location selection. The discussion focuses on how the defined criteria, assigned weights, and alternative evaluations influence the decision-making outcomes, providing insights into the effectiveness and practical relevance of the proposed approach.

3.1 Criteria Weighting and Alternative Assessment Results

Figure 2 illustrates the criteria weighting configuration and the alternative assessment matrix used in the proposed TOPSIS-based Decision Support System. The figure shows ten decision criteria (K1–K10) along with their assigned weights and criterion types, categorized into benefit and cost criteria according to their influence on strategic business location selection. Criteria with higher weights represent factors considered more influential in the decision-making process, while the classification into benefit and cost types determines how each criterion contributes to the formation of positive and negative ideal solutions in the TOPSIS method. The alternative assessment matrix presents the performance scores of each candidate location across all criteria, derived from field observations, regional statistical data, and expert judgment, and expressed on a consistent numerical scale. Variations in these scores reflect the distinct characteristics of each location, such as differences in accessibility, market potential, infrastructure quality, and operational costs. By integrating criteria weights and alternative evaluations into a structured matrix, the system ensures transparency and objectivity in transforming expert preferences into quantitative inputs, thereby providing a reliable basis for subsequent TOPSIS computations and ranking analysis.

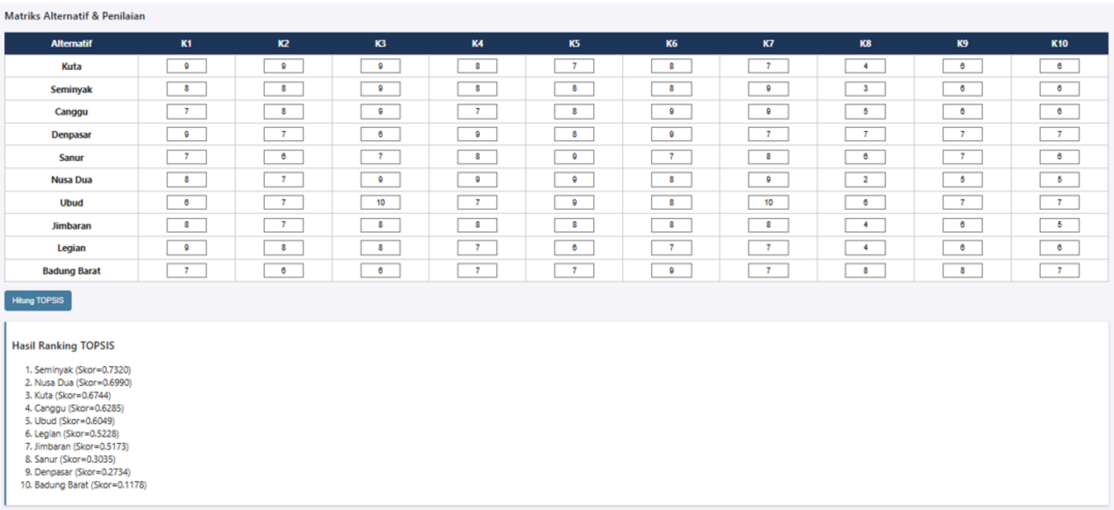
Kriteria	Bobot	Jenis (B/C)
K1	0.1	Benefit
K2	0.21	Benefit
K3	0.28	Benefit
K4	0.11	Benefit
K5	0.11	Benefit
K6	0.08	Benefit
K7	0.13	Benefit
K8	0.09	Cost
K9	0.03	Cost
K10	0.03	Cost

Matriks Alternatif & Penilaian

Alternatif	K1	K2	K3	K4	K5	K6	K7	K8	K9	K10
Kuta	9	9	9	8	7	8	7	4	6	6
Seminyak	8	8	9	8	8	8	9	3	6	6
Canggu	7	8	9	7	8	9	9	5	6	6
Denpasar	9	7	6	9	8	9	7	7	7	7
Sanur	7	6	7	8	9	7	8	6	7	6
Nusa Dua	8	7	9	9	9	8	9	2	5	5
Ubud	6	7	10	7	9	8	10	6	7	7
Jimbaran	8	7	8	8	8	8	8	4	6	5
Legian	9	8	8	7	6	7	7	4	6	6
Badung Barat	7	6	6	7	7	9	7	8	8	7

Figure 2. Criteria weights, criterion types, and alternative assessment matrix used in the TOPSIS-based decision support system.

Figure 3 presents the results of alternative evaluation and final ranking produced by the TOPSIS-based Decision Support System. The figure illustrates the normalized and weighted decision matrix for each candidate business location, followed by the computation of preference values and ranking outcomes. Each alternative is evaluated across ten decision criteria (K1–K10), reflecting variations in strategic factors such as accessibility, market potential, infrastructure quality, and operational considerations. The resulting TOPSIS preference scores indicate the relative closeness of each alternative to the ideal solution. A higher score represents a more preferable business location according to the defined criteria weights and assessment values. The ranking results demonstrate that the proposed system is capable of clearly differentiating among alternatives and providing an interpretable priority order, thereby supporting objective and transparent strategic decision-making.


Matriks Alternatif & Penilaian

Alternatif	K1	K2	K3	K4	K5	K6	K7	K8	K9	K10
Kuta	9	9	9	8	7	8	7	4	6	6
Seminyak	8	8	9	8	8	8	9	3	6	6
Canggu	7	8	9	7	8	9	9	5	6	6
Denpasar	9	7	6	9	8	9	7	7	7	7
Sanur	7	6	7	8	9	7	8	6	7	6
Nusa Dua	8	7	9	9	9	8	9	2	5	5
Ubud	6	7	10	7	9	8	10	6	7	7
Jimbaran	8	7	8	8	8	8	8	4	6	5
Legian	9	8	8	7	6	7	7	4	6	6
Badung Barat	7	6	6	7	7	9	7	8	8	7

Hitung TOPSIS

Hasil Ranking TOPSIS

1. Seminyak (Skor=0.7320)
2. Nusa Dua (Skor=0.6990)
3. Kuta (Skor=0.6744)
4. Canggu (Skor=0.6285)
5. Ubud (Skor=0.6049)
6. Legian (Skor=0.5228)
7. Jimbaran (Skor=0.5173)
8. Sanur (Skor=0.3035)
9. Denpasar (Skor=0.2734)
10. Badung Barat (Skor=0.1178)

Figure 3. Decision matrix processing and final ranking of business location alternatives using the TOPSIS method.

4. CONCLUSIONS

This study has presented a Decision Support System for strategic business location selection based on the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS). The proposed approach systematically integrates multiple decision criteria, including both benefit and cost factors, to support objective and transparent evaluation of alternative business locations. Through structured data collection, preprocessing, and TOPSIS computation, the system successfully transforms expert judgments and regional data into quantitative decision inputs. The results demonstrate that the proposed system is capable of producing consistent and interpretable rankings of business location alternatives, thereby assisting decision-makers in identifying the most preferable location based on defined priorities and constraints. The implementation of the system in a web-based environment further enhances its practicality and accessibility, particularly for small and medium-sized enterprises that require a simple yet reliable decision-making tool.

Despite the effectiveness of the proposed approach, several opportunities for future work remain. Future research may focus on integrating advanced weighting techniques, such as fuzzy logic or entropy-based methods, to better handle uncertainty and subjectivity in criteria assessment. Additionally, the incorporation of Geographic Information Systems (GIS) could enhance spatial analysis and visualization capabilities, providing richer contextual insights for location-based decisions. Further improvements may also include the application of machine learning techniques to dynamically adjust criteria weights or pre-filter alternatives based on historical data. These enhancements are expected to improve the adaptability, accuracy, and scalability of the decision support system in more complex and dynamic business environments.

The experimental results show that the proposed system successfully produces a clear ranking of business location alternatives based on TOPSIS preference values, enabling decision-makers to objectively identify the most suitable location.

5. SUGGESTION

Future research is recommended to extend the proposed decision support system by incorporating uncertainty-handling mechanisms, such as fuzzy logic or probabilistic weighting models, to better represent subjective judgments and incomplete information in real-world decision-making scenarios. In addition, the integration of Geographic Information Systems (GIS) can be explored to enhance spatial analysis and visualization, allowing decision-makers to better understand geographical influences on business location selection. Further studies may also investigate the application of machine learning techniques to automatically adjust criteria weights or to pre-screen potential locations based on historical business performance data. Moreover, evaluating the proposed approach across different business domains and geographic contexts with larger and more diverse datasets would provide deeper insights into its generalizability, scalability, and robustness.

REFERENCES

[1] S. Ahmad and M. N. Khan, "Decision support systems in business analytics: A systematic review," IEEE Access, vol. 8, pp. 189456–189470, 2020, doi: 10.1109/ACCESS.2020.3032432.

[2] J. Han, M. Kamber, and J. Pei, *Data Mining: Concepts and Techniques*, 3rd ed. Morgan Kaufmann, 2021, doi: 10.1016/C2018-0-02023-2.

[3] A. Buhalis and R. Law, "Progress in information technology and tourism management: 20 years on and 10 years after the Internet," *Tourism Management*, vol. 79, pp. 104–116, 2020, doi: 10.1016/j.tourman.2020.104116.

[4] C. L. Hwang and K. Yoon, *Multiple Attribute Decision Making: Methods and Applications*, Springer, 2020, doi: 10.1007/978-3-642-48318-7.

[5] L. Wang, Y. Li, and J. Zhang, "Multi-criteria decision-making approaches for location selection: A comparative study," *Expert Systems with Applications*, vol. 159, pp. 113129, 2021, doi: 10.1016/j.eswa.2020.113129.

[6] R. R. Yager and D. P. Filev, "Essential approaches to decision support systems using MCDM methods," *Applied Soft Computing*, vol. 114, pp. 108122, 2022, doi: 10.1016/j.asoc.2021.108122.

[7] R. Kumar, S. Singh, and P. K. Sharma, "A hybrid AHP–TOPSIS based decision support system for retail location selection," *Expert Systems with Applications*, vol. 168, pp. 114125, 2021, doi: 10.1016/j.eswa.2020.114125.

[8] Y. Chen, H. Zhang, and L. Xu, "A TOPSIS-based decision support framework for commercial site selection," *Journal of Business Research*, vol. 134, pp. 1–12, 2021, doi: 10.1016/j.jbusres.2021.05.012.

[9] M. Rahman, A. H. M. Zahirul Alam, and N. Huda, "Integrating GIS and TOPSIS for urban business location planning," *Applied Soft Computing*, vol. 102, pp. 107123, 2021, doi: 10.1016/j.asoc.2021.107123.

[10] X. Li, J. Wu, and Q. Zhou, "An intelligent decision support system for location selection using clustering and TOPSIS," IEEE Access, vol. 11, pp. 45678–45691, 2023, doi: 10.1109/ACCESS.2023.3278914.