Journal of Information System and Technology Research

journal homepage: https://journal.aira.or.id/index.php/jistr/

A Systematic Literature Review of AHP–TOPSIS Applications in Decision Support Systems

Durrotul Mufidah Inafah[1*], Tri Rijanto[2], Yeni Anistyasari[3]

[1,2,3]Technology and Vocational Education, Postgraduate Faculty, State University of Surabaya, Indonesia

ARTICLE INFO

Article history:

Received Jan 23, 2026
Accepted April 01, 2026
Available online May 31, 2026

Keywords:

AHP
DSS
TOPSIS
Multicriteria Decision Making.
Systematic Literature Review

How to Cite :
Inafah, D. M., Rijanto, T., & Anistyasari, Y. (2026). A systematic literature review of AHP–TOPSIS applications in decision support systems. *Journal of Information System and Technology Research, 5*(2), 257-269.

ABSTRACT

Decision Support Systems (DSS) increasingly utilize Multi-Criteria Decision Making (MCDM) methods to address complex decision problems involving multiple and often conflicting criteria. Among these methods, the AHP–TOPSIS hybrid approach has gained significant attention due to its ability to combine structured criteria weighting with objective alternative ranking. However, existing studies are generally fragmented and domain-specific, limiting a comprehensive understanding of its application trends and methodological patterns. This study aims to provide a systematic synthesis of AHP–TOPSIS applications in DSS through a Systematic Literature Review (SLR). The review follows PRISMA guidelines and analyzes 20 journal articles published between 2014 and 2025, sourced from Google Scholar, Garuda, and SINTA databases, with limited support from Scopus-indexed references. The results show a notable increase in publications after 2020, indicating the growing importance of data-driven and transparent decision-making in the context of Industry 4.0 and 5.0. The majority of studies focus on selection and ranking problems, particularly in education, human resource management, and industrial applications. A consistent methodological pattern is observed, where AHP is used for determining criteria weights and TOPSIS is applied for ranking alternatives. This study contributes by providing a cross-domain perspective on the use of AHP–TOPSIS, highlighting its methodological consistency, adaptability, and practical relevance. The findings also suggest opportunities for future research, particularly in integrating AHP–TOPSIS with advanced approaches such as fuzzy logic and intelligent systems to address uncertainty and dynamic decision environments.

Corresponding Author:

Durrotul Mufidah Inafah,
Technology and Vocational Education, Postgraduate Faculty,
State University of Surabaya,
Surabaya, East Java, Indonesia
Email: durrotul004@gmail.com

1. INTRODUCTION

A Decision Support System (DSS) is a computer-based system designed to assist decision-makers in solving semi-structured and unstructured problems by utilizing data, analytical models, and computational techniques. In complex decision environments, decision-makers are often faced with multiple conflicting criteria, making intuitive approaches insufficient and prone to bias. Therefore, systematic and objective approaches based on Multi-Criteria Decision Making (MCDM) have become essential in supporting rational decision processes [1], [2].

From a theoretical perspective, MCDM methods originate from decision theory, which emphasizes rational choice under multiple criteria and uncertainty. Over time, MCDM has evolved from simple additive models into more sophisticated hybrid approaches capable of addressing complex, real-world decision problems. In this context, DSS integrated with MCDM methods has become increasingly relevant in modern decision environments, particularly in the era of Industry 4.0 and Industry 5.0, where decision-making requires transparency, adaptability, and data-driven justification [3]

Various MCDM methods have been widely implemented in DSS, including Simple Additive Weighting (SAW), Weighted Product (WP), Analytic Hierarchy Process (AHP), TOPSIS, VIKOR, and MOORA [4], [5]. Each method offers distinct advantages. For example, SAW is simple and computationally efficient but lacks robustness in handling complex criteria interactions, while VIKOR emphasizes compromise solutions and MOORA provides flexibility in normalization techniques. However, these methods may face limitations in balancing criteria weighting and alternative ranking simultaneously.

Despite its strengths, AHP has limitations when applied independently for ranking a large number of alternatives, especially in complex decision scenarios. On the other hand, TOPSIS is effective in ranking alternatives based on their relative distance to ideal solutions but does not inherently provide a mechanism for deriving criteria weights [6].

To overcome these limitations, the integration of AHP and TOPSIS has emerged as a hybrid approach that combines the strengths of both methods. AHP is used to determine criteria weights, while TOPSIS is applied to rank alternatives based on their proximity to ideal solutions. This combination has been shown to improve decision accuracy, objectivity, and transparency compared to single-method approaches [7]. Compared to other MCDM methods such as SAW, VIKOR, and MOORA, the AHP–TOPSIS hybrid approach offers a more balanced framework by integrating structured weighting and robust ranking mechanisms.

In recent years, the application of AHP–TOPSIS in DSS has significantly increased across various domains, including education, human resource management, supplier selection, infrastructure planning, and industrial decision-making [8], [9] Recent studies highlight the growing adoption of hybrid MCDM approaches in DSS environments, particularly in addressing complex and data-driven decision problems. This trend is further reinforced by the increasing need for systematic and transparent decision-making frameworks in the era of Industry 4.0 and Industry 5.0 [10]. These findings indicate that hybrid methods such as AHP–TOPSIS are increasingly recognized as effective tools for handling multi-criteria decision problems under uncertainty and dynamic conditions.

Despite this growing body of research, existing studies predominantly focus on case-based implementations within specific domains, limiting the generalizability of findings [11]. Moreover, several existing Systematic Literature Reviews (SLRs) primarily emphasize comparisons among general MCDM methods or focus on specific application areas, rather than providing a comprehensive cross-domain synthesis of the AHP–TOPSIS method [12]. As a result, current literature lacks a structured and integrative understanding of research trends, dominant application domains, decision characteristics, and methodological patterns associated with AHP–TOPSIS.

This limitation highlights a critical research gap. Existing SLRs are insufficient because they do not specifically focus on the AHP–TOPSIS hybrid method, lack cross-domain analysis, and often do not incorporate recent developments in the last decade. Consequently, there is a need for a comprehensive and up-to-date systematic review that synthesizes recent empirical findings and identifies emerging trends and research gaps.

Based on this gap, this study aims to conduct a comprehensive Systematic Literature Review (SLR) on the application of the AHP–TOPSIS method in Decision Support Systems. Specifically, this study aims to: 1) analyze publication trends; 2) identify dominant application domains and decision problem characteristics; 3) examine methodological patterns and variations; and 4) evaluate the advantages and limitations of AHP–TOPSIS compared to other MCDM methods.

The main contribution of this study is to provide an integrative and up-to-date synthesis of AHP–TOPSIS applications across multiple domains based on systematically selected journal articles. Unlike previous studies, this research does not merely compare methods or focus on single-domain implementations but provides a cross-domain mapping of trends, application areas, and methodological characteristics. By synthesizing recent publications (2014–2025), this study offers novel insights into the evolution, relevance, and future directions of AHP–TOPSIS in DSS.

Related Work

In addition to widely used MCDM frameworks, several foundational studies have significantly contributed to the development of decision support systems and systematic review methodologies [13]. Classical DSS concepts proposed by Turban and fundamental MCDM frameworks described by Ishizaka and Nemery provide the theoretical basis for decision-making models. Furthermore, established guidelines for conducting systematic literature reviews, such as those proposed [14], [15], [16], and Page et al. [17], ensure methodological rigor and transparency in this study.

Recent studies have demonstrated the increasing adoption of Multi-Criteria Decision Making (MCDM) methods, particularly hybrid approaches such as AHP–TOPSIS, in various Decision Support System (DSS) applications. However, existing literature shows that most studies remain domain-specific and lack integrative analysis across multiple application areas.

Recent studies published in the Journal of Information System and Technology Research (JISTR) also demonstrate the growing role of Decision Support Systems in supporting intelligent and data-driven decision-making processes. Ningsiah et al. developed an intelligence-oriented system architecture that integrates data analytics and decision-support mechanisms within a unified information system framework, emphasizing the importance of transforming data into actionable intelligence for managerial decision-making [18]. In addition, Yahya et al. proposed a web-based Decision Support System for inventory procurement optimization using Pareto Analysis, demonstrating that systematic decision-support approaches can improve efficiency, transparency, and operational performance [19]. These studies further confirm the importance of DSS methodologies in supporting objective and evidence-based decision-making across various domains.

For example, Puspitasari and Febriani [33] applied the AHP–TOPSIS method for material supplier selection and demonstrated improved decision accuracy through structured weighting and ranking processes. Similarly, Sahin and Aksoy utilized a combined AHP–TOPSIS framework for highway pavement selection, showing its effectiveness in infrastructure decision-making scenarios involving multiple conflicting criteria. Liu et al. further confirmed the robustness of AHP–TOPSIS in maintenance planning, particularly in handling complex evaluation parameters. Furthermore, recent studies also demonstrate the application of AHP–TOPSIS in renewable energy project evaluation, emphasizing sustainability considerations, cost efficiency, and risk assessment in complex decision environments [20].

Several recent reviews have emphasized the increasing use of hybrid decision-making models, particularly AHP–TOPSIS, in addressing complex multi-criteria problems [21].

In the context of industrial and modern decision environments, Abdel-Basset et al. emphasized that MCDM-based frameworks, including hybrid approaches, play a significant role in supporting decision-making in Industry 5.0 due to their transparency and systematic structure. Additionally, Handayani et al. highlighted the integration of MCDM with bibliometric intelligence to enhance decision quality in agro-industrial applications.

Several studies have also explored variations of the AHP–TOPSIS method. Sequeira et al. [22] proposed a fuzzy AHP–TOPSIS model to address uncertainty in manufacturing decisions, while Velmurugan et al. [23] applied a hybrid fuzzy approach to analyze human error factors in maintenance systems. These studies indicate that methodological extensions are often introduced to improve the flexibility and applicability of the AHP–TOPSIS framework.

Despite these advancements, most existing works focus primarily on specific case studies and do not provide a generalized understanding of how AHP–TOPSIS is applied across domains. Furthermore, some studies emphasize performance comparison between methods, such as AHP, TOPSIS, SAW, and other MCDM techniques, but lack comprehensive analysis of research trends and application patterns.

In addition, several Systematic Literature Review (SLR) studies have been conducted in the field of MCDM. Mardani et al. provided a broad review of MCDM techniques and their applications; however, the study focused on general methodological comparisons rather than specific hybrid approaches. Permana and Wening conducted an SLR on AHP–TOPSIS, but their work primarily addressed decision-making behavior (e.g., groupthink mitigation) rather than mapping application domains and research trends. Similarly, Al Farisi et al. focused on AHP–TOPSIS applications in the education sector, limiting its scope to a single domain.

These limitations indicate that existing SLRs are still insufficient in providing a comprehensive, cross-domain synthesis of AHP–TOPSIS applications in DSS. Specifically, prior studies lack: 1) integrative analysis of publication trends; 2) cross-domain comparison of application areas; 3) identification of decision object characteristics; and 4) systematic evaluation of methodological patterns.

Therefore, this study addresses these gaps by conducting a comprehensive Systematic Literature Review that focuses exclusively on the AHP–TOPSIS method across multiple domains. Unlike previous studies, this research provides a structured and up-to-date synthesis of recent literature (2014–2025), offering deeper insights into research trends, methodological evolution, and application diversity of AHP–TOPSIS in Decision Support Systems.

2. RESEARCH METHOD

This study employs the Systematic Literature Review (SLR) method to systematically identify, evaluate, and synthesize relevant research on the application of the AHP–TOPSIS method in Decision Support Systems. The SLR approach was selected due to its ability to provide a structured, transparent, and reproducible framework for analyzing research trends and identifying knowledge gaps [24], [25].

2.1 Types of Research

This study is qualitative research using a Systematic Literature Review approach. The research process follows three main stages: planning, conducting, and reporting the review. This approach enables a comprehensive exploration of research developments, methodological patterns, and application domains of the AHP–TOPSIS method in Decision Support Systems.

From an analytical perspective, this study not only summarizes previous findings but also critically evaluates methodological trends, compares findings across studies, and identifies emerging patterns in the application of AHP–TOPSIS.

2.2 Research Questions

To ensure a focused and systematic review process, the following Research Questions (RQs) are defined:

RQ1: What are the publication trends of AHP–TOPSIS applications in Decision Support Systems?

RQ2: Which application domains most frequently utilize the AHP–TOPSIS method?

RQ3: What are the advantages and limitations of AHP–TOPSIS compared to other MCDM methods?

2.3 Literature Search Strategy

The literature search was conducted using multiple databases, including Google Scholar, Garuda, and SINTA, which provide broad coverage of national and regional publications in the fields of information systems and decision support systems. In addition, Scopus-indexed articles were selectively included through cross-referencing to enhance the quality and credibility of the reviewed studies.

The exclusion of direct database querying via Scopus or Web of Science is acknowledged as a limitation; however, this study mitigates this limitation by incorporating Scopus-indexed articles from highly cited journals referenced within the retrieved literature. This approach ensures that high-quality international studies are still represented in the review. The search process employed predefined keywords and Boolean operators to ensure consistency and reproducibility. The search was limited to publications between 2014 and 2025 to capture recent developments in AHP–TOPSIS research.

Table 1. Literature Search Strategy

Database	Search String
Google Scholar	("AHP" AND "TOPSIS" AND "Decision Support System")
Garuda	AHP TOPSIS SPK
SINTA	AHP TOPSIS

Source: Adapted from Kitchenham and Charters, processed by the authors (2026).

Table 1 presents the databases and search strings used in the literature retrieval process. The combination of English and Indonesian keywords enabled the inclusion of both international and national publications, thereby expanding the scope of relevant studies. Furthermore, the use of multiple databases and structured search strings enhances the transparency and reproducibility of the review process. This systematic approach provides a solid foundation for subsequent stages, including literature screening, selection, and quality assessment in accordance with established SLR guidelines.

Several applied studies also demonstrate the implementation of AHP–TOPSIS in various decision contexts, such as welfare assessment and selection systems [26], [27] further confirming its practical relevance in real-world DSS applications.

2.4 Inclusion and Exclusion Criteria

The inclusion criteria in this study include scientific journal articles discussing the application of AHP and/or TOPSIS methods in Decision Support Systems, articles available in full text, and articles relevant to the research topic. Meanwhile, the exclusion criteria include articles that have no direct relationship to Decision Support Systems, duplicate articles that appear more than once in the search process, and non-scientific publications such as popular articles or non-academic reports.

2.5 Literature Selection Process (PRISMA)

The study follows the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework to ensure a transparent and systematic selection process. In the identification stage, 200 articles were retrieved from the selected databases, and an additional 10 articles were identified through other sources, resulting in a total of 210 articles. After removing duplicates, 150 unique articles remained. During the screening stage, titles and abstracts were evaluated based on relevance, resulting in the exclusion of 90 articles. Consequently, 60 articles were selected for full-text assessment. In the eligibility stage, the full texts of 60 articles were assessed using the predefined inclusion and exclusion criteria. A total of 40 articles were excluded due to insufficient relevance or incomplete methodological details. Finally, 20 articles were included in the review. Although the final number of selected articles (n = 20) may appear limited, this reflects the strict application of inclusion criteria and quality standards. This selective approach ensures that only the most relevant and methodologically sound studies are included, thereby increasing the reliability of the analysis. All stages of the selection process are illustrated in the PRISMA flow diagram shown in Figure 1 [28]. The article selection process based on the PRISMA framework is presented in Figure 1.

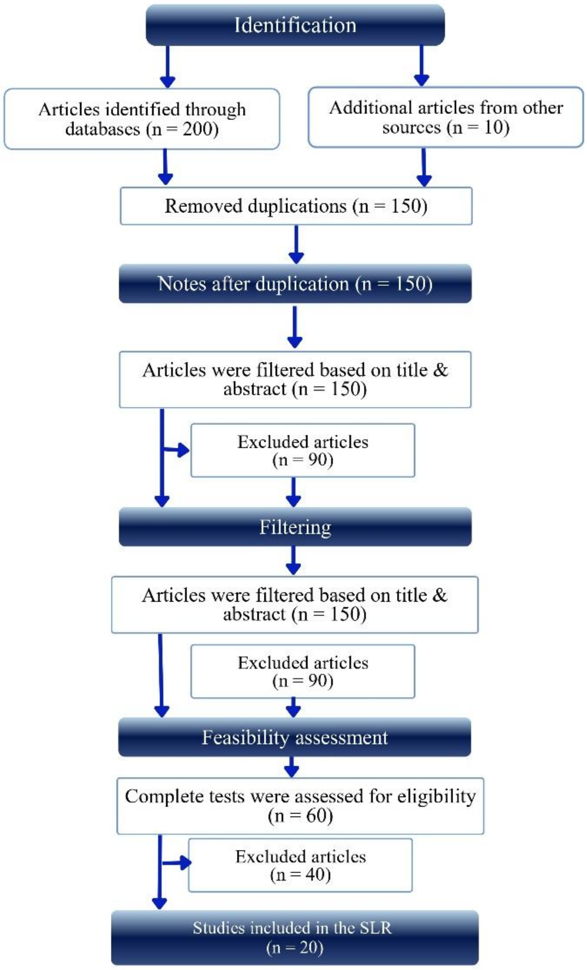

Figure 1. Flowchart of Literature Selection Based on PRISMA
Adapted from PRISMA 2020 Statement by Page et al. [17], processed by the authors (2026).

Based on the PRISMA flow diagram presented in Figure 1, a total of 20 articles were finally selected and included in this Systematic Literature Review. These articles were considered the most relevant and met all inclusion criteria, and they subsequently served as the primary sources for further analysis of trends and application areas of the AHP–TOPSIS method in decision support systems.

2.6 Quality Assessment

A quality assessment was conducted to ensure the reliability and validity of the selected studies. Each article was evaluated based on predefined criteria adapted from SLR guidelines.

Table 2. Quality Criteria

Code	Quality Criteria
QA1	Published in a peer-reviewed journal
QA2	Clear description of AHP–TOPSIS methodology
QA3	Complete presentation of decision criteria and alternatives

Adapted from Kitchenham and Charters, processed by the authors (2026).

Each study was assessed against these criteria, and only articles meeting at least two criteria were included. The results indicate that all selected studies meet the minimum quality threshold, ensuring sufficient methodological rigor for further analysis.

2.7 Analytical Approach and Trend Interpretation

Unlike purely descriptive reviews, this study applies a critical synthesis approach to analyze the selected literature. The analysis focuses on identifying patterns, comparing methodologies, and evaluating the evolution of AHP–TOPSIS applications across domains. Particular attention is given to the increasing trend of publications after 2020. This growth is closely related to the rising complexity of decision-making in Industry 4.0 and Industry 5.0 environments, where hybrid MCDM methods are increasingly required to support data-driven and transparent decision processes. This analytical perspective enables the study to go beyond summarization and provide meaningful insights into the development, relevance, and future direction of the AHP–TOPSIS method in Decision Support Systems.

3. RESULTS AND DISCUSSION

This section reports the results and discussion derived from the selected articles obtained through the Systematic Literature Review process. The analysis emphasizes four main aspects, namely publication trends over time, dominant application areas, patterns of method usage, and comparative insights between the AHP–TOPSIS approach and other Multi-Criteria Decision Making (MCDM) methods. The discussion is developed based on empirical findings reported in previous studies rather than theoretical explanations.

3.1. Distribution of Articles by Year of Publication

The analysis of publication years reveals not only a quantitative increase but also a qualitative shift in research focus regarding the application of the AHP–TOPSIS method in Decision Support Systems. In the earlier period, studies integrating AHP and TOPSIS were relatively limited and primarily focused on narrow and domain-specific decision-making problems, such as simple ranking or selection tasks.

However, a gradual increase in publications is observed over time, indicating a growing recognition of hybrid Multi-Criteria Decision Making (MCDM) approaches as effective tools for structured decision analysis. More importantly, the findings show a significant surge in publications after 2020, which suggests a transformation in how decision-making problems are approached in both academic and practical contexts.

This post-2020 increase can be critically interpreted through several key factors. First, the rapid advancement of digital transformation and Industry 4.0/5.0 has intensified the need for intelligent and data-driven decision support systems. Organizations increasingly require methods that can handle complex, multi-criteria environments, where AHP–TOPSIS provides a balanced combination of weighting (AHP) and ranking (TOPSIS).

Second, the impact of the COVID-19 pandemic has accelerated the demand for systematic and transparent decision-making models, particularly in sectors such as healthcare, logistics, and resource allocation. In such uncertain conditions, hybrid MCDM methods offer robustness and adaptability, making them more widely adopted compared to single-method approaches.

Third, compared to other MCDM methods such as SAW, VIKOR, and MOORA, the AHP–TOPSIS combination demonstrates a stronger capability in handling both subjective judgments and objective evaluation simultaneously. While SAW is simpler but less robust in handling conflicting criteria, and VIKOR focuses on compromise solutions, AHP–TOPSIS provides a more structured and interpretable framework. This advantage contributes to its increasing preference in recent studies.

Despite this growth, the analysis also indicates a limitation in the distribution of studies, where the number of selected articles remains relatively small. This suggests that although the trend is increasing, the research landscape is still developing and not yet saturated, leaving opportunities for further exploration and methodological refinement. Therefore, the increasing trend after 2020 is not merely a numerical growth but reflects a paradigm shift toward more systematic, hybrid, and data-driven decision-making approaches, positioning AHP–TOPSIS as a relevant and evolving method within Decision Support Systems research. To provide a clearer overview of this trend, Figure 2 illustrates the distribution of selected articles based on their year of publication.

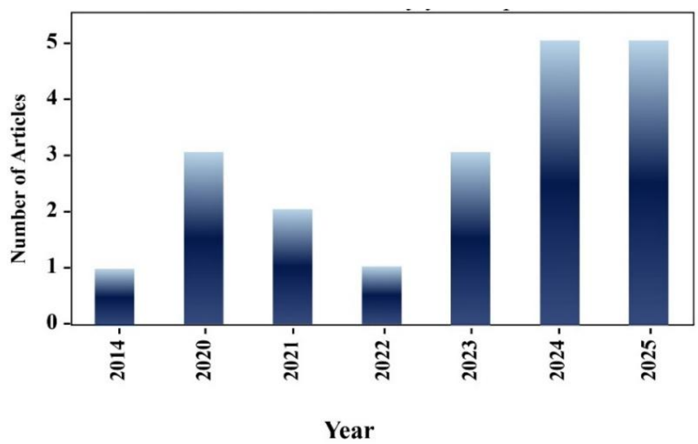

Figure 2. Distribution of Articles by Year of Publication
Research data processed by the authors based on selected studies (2026).

Figure 2 clearly shows a significant increase in publications after 2020, confirming the growing research interest in hybrid MCDM approaches. This trend indicates that researchers are increasingly recognizing the importance of combining methods such as AHP and TOPSIS to address complex and multi-criteria decision-making problems. Furthermore, the upward pattern suggests a shift toward more systematic, data-driven, and transparent decision-support models, particularly in response to the growing demands of digital transformation and dynamic decision environments.

3.2. Fields of Application of the AHP–TOPSIS Method

The findings of the literature review indicate that the AHP–TOPSIS method has been applied across various decision-making domains, with a strong concentration in education, human resource management, industry, and strategic location selection. These domains generally involve multi-criteria evaluation problems that require balancing both qualitative and quantitative factors, making them well-suited for hybrid MCDM approaches. From an analytical perspective, this distribution suggests that AHP–TOPSIS is predominantly utilized in semi-structured decision environments, where decision criteria are clearly defined but still involve subjective judgment. In such contexts, AHP plays a crucial role in capturing expert preferences through pairwise comparisons, while TOPSIS provides a systematic ranking mechanism based on the concept of ideal solutions.

To provide a clearer and more systematic overview of the reviewed studies, Table 3 presents a summary of the selected articles included in this Systematic Literature Review. The table highlights key aspects such as application fields, decision objects, main evaluation criteria, and the principal outcomes reported in each study.

Table 3. Summary of Characteristics of Selected Articles in the SLR Study

No	Author (Year)	Method	Object / Case	Main Criteria	Key Results
1	[4]	AHP–TOPSIS	Best lecturer selection	Publication, SINTA, teaching	Produces objective lecturer ranking results.
2	[7]	AHP–TOPSIS	Outstanding student recommendation	Academic achievement, activity, attitude	Supports objective student selection.
3	[8]	AHP–TOPSIS	Highway pavement type selection	Cost, durability, maintenance	Assists in selecting the optimal pavement type.
4	[9]	AHP–TOPSIS	Pavement preventive maintenance	Condition, traffic, cost	Supports maintenance prioritization decisions.
5	[10]	MCDM	Supplier selection in agro-industry	Quality, price, delivery, sustainability	Improves supplier selection effectiveness.
6	[11]	Hybrid AHP–TOPSIS	Sustainable supply chain performance	Economic, environmental, social aspects	Evaluates supply chain sustainability performance.
7	[15]	Hybrid AHP–TOPSIS	Smart city development evaluation	Infrastructure, technology, sustainability	Supports smart city assessment.
8	[16]	AHP–TOPSIS	Oil and gas pipeline risk evaluation	Risk, safety, reliability	Improves risk assessment accuracy.

No	Author (Year)	Method	Object / Case	Main Criteria	Key Results
9	[22]	Fuzzy AHP–TOPSIS	Manufacturing relocation decisions	Cost, risk, flexibility	Supports strategic relocation decisions.
10	[26]	AHP–TOPSIS	Coastal community welfare measurement	Income, education, housing	Helps map welfare levels objectively.
11	[27]	AHP–TOPSIS	Scholarship recipient selection	Achievement, economic condition, responsibility	Produces fair scholarship recommendations.
12	[28]	AHP–TOPSIS	Bamboo product evaluation	Quality, cost, sustainability	Effective for selecting superior products.
13	[29]	AHP	High-achieving employee selection	Performance, discipline, loyalty	Produces objective employee rankings.
14	[30]	AHP–TOPSIS	Culinary business location selection	Accessibility, facilities, environment	Determines the best business location.
15	[31]	AHP–TOPSIS	Material supplier selection	Quality, cost, delivery	Improves supplier selection decisions.
16	[32]	Hybrid AHP–TOPSIS & ML	Graduate employability prediction	Academic achievement, skills, experience	Improves employability prediction accuracy.

Compiled from selected studies, processed by the authors (2026).

Table 3 summarizes the decision objects, main evaluation criteria, and key outcomes reported in each study, enabling cross-study comparison across different application domains. Based on Table 3, the majority of studies focus on selection and ranking problems, particularly in education and human resource management. Common cases include staff promotion, scholarship selection, lecturer evaluation, employee performance assessment, and loan eligibility determination. This pattern indicates that AHP–TOPSIS is highly preferred in decision scenarios where fairness, transparency, and accountability are essential.

However, a deeper analysis reveals that the dominance of these domains is not merely coincidental. Compared to more complex domains such as real-time analytics or large-scale industrial optimization, the selected application areas tend to involve moderate data complexity and well-defined criteria, allowing AHP–TOPSIS to be implemented effectively without requiring advanced computational integration.

When compared with other MCDM methods, such as SAW, MOORA, and VIKOR, AHP–TOPSIS demonstrates several practical advantages. SAW, for instance, is simpler but less robust in handling subjective weighting, while MOORA offers efficiency but lacks interpretability in some decision contexts. VIKOR, on the other hand, emphasizes compromise solutions but may be less intuitive for decision-makers. In contrast, AHP–TOPSIS provides a balanced framework that integrates subjective judgment (AHP) and objective ranking (TOPSIS), making it more adaptable across various application domains. To further illustrate the distribution of application domains identified in the reviewed literature, Figure 3 shows the proportion of AHP–TOPSIS applications across different fields.

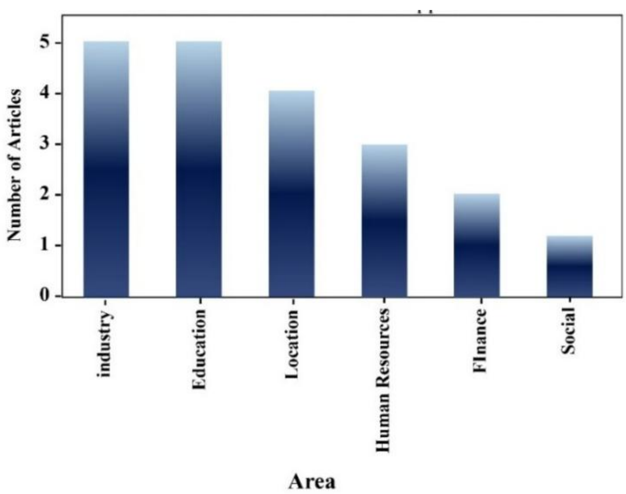

Figure 3. Distribution of AHP–TOPSIS Application Areas
Research data processed by the authors based on selected studies (2026).

As shown in Figure 3, the education and industry sectors represent the most dominant application areas of the AHP–TOPSIS method. This dominance reflects the high demand for structured decision-making tools in these fields, particularly in evaluation, selection, and resource allocation processes. Furthermore, the relatively lower adoption in financial and social sectors suggests potential research opportunities, as these areas often involve higher uncertainty and dynamic variables that may require integration with more advanced or hybrid decision-making models. Overall, the distribution of application areas indicates that AHP–TOPSIS is most effectively applied in domains requiring transparent, systematic, and multi-criteria evaluation, while its limited adoption in more complex environments highlights the need for methodological extensions or integration with emerging intelligent systems.

3.3 Method Usage Patterns

The analysis of the reviewed articles reveals a consistent and dominant methodological pattern, in which AHP is primarily utilized for criteria weighting, while TOPSIS is applied for ranking alternatives. This recurring combination highlights the complementary roles of the two methods in addressing multi-criteria decision-making problems, where both subjective judgment and objective evaluation are required.

From an analytical perspective, this pattern reflects a broader methodological preference for hybrid MCDM approaches that integrate different strengths within a single decision framework. AHP contributes to capturing expert judgment through pairwise comparisons, while TOPSIS enhances decision accuracy by evaluating alternatives based on their distance from ideal and negative-ideal solutions. This synergy explains why the AHP–TOPSIS combination is consistently adopted across various application domains, as discussed in the previous section.

To further illustrate the distribution of methods used in the reviewed studies, Figure 4 presents the proportion of decision-making approaches identified in the literature.

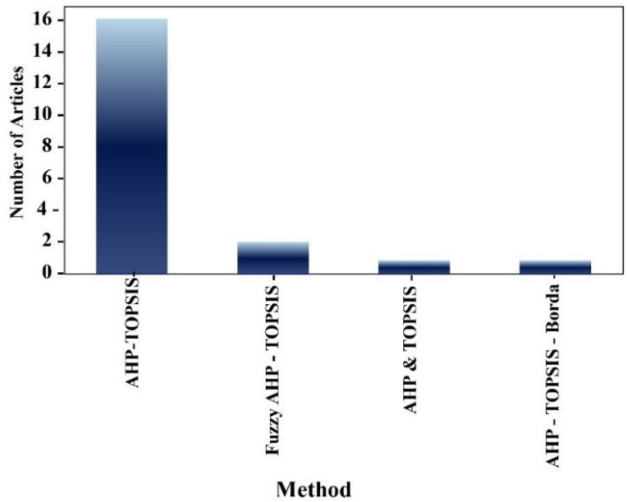

Figure 4. Distribution of Methods in the SLR AHP–TOPSIS article
Research data processed by the authors based on selected studies (2026).

As shown in Figure 4, the standard AHP–TOPSIS combination clearly dominates compared to other hybrid approaches. This dominance indicates not only its widespread adoption but also its perceived reliability and practicality among researchers and practitioners. However, a deeper examination reveals that alternative approaches such as Fuzzy AHP–TOPSIS, AHP–VIKOR–TOPSIS, and AHP–TOPSIS–Borda are introduced to address specific limitations of the standard model. For example, the incorporation of fuzzy logic aims to handle uncertainty and vagueness in human judgment, while integration with VIKOR supports compromise solutions in conflicting decision scenarios. Despite these enhancements, their adoption remains relatively limited due to increased computational complexity and reduced interpretability.

In comparison with single MCDM methods such as SAW or MOORA, the AHP–TOPSIS combination offers a more balanced framework by integrating weighting and ranking mechanisms within a unified process. While simpler methods may be easier to implement, they often lack the robustness required for handling complex decision criteria, which explains the continued preference for hybrid approaches in recent studies.

Furthermore, the dominance of AHP–TOPSIS also reflects practical considerations, particularly in terms of ease of implementation, methodological transparency, and adaptability across different domains. These characteristics make it especially suitable for decision support systems that require explainable and justifiable outputs. Nevertheless, the limited variation in method usage patterns suggests a potential gap in methodological exploration. Future research may benefit from exploring more advanced hybridizations or integrating AHP–TOPSIS with emerging technologies such as machine learning or big data analytics to address increasingly complex decision environments.

3.4 Comparison with Other Methods

The comparative analysis reveals that the AHP–TOPSIS approach consistently demonstrates methodological advantages over other commonly used MCDM techniques such as Simple Additive Weighting (SAW), Weighted Product (WP), and MOORA. While these alternative methods are widely applied due to their computational simplicity, the reviewed studies indicate that they tend to rely on direct aggregation mechanisms that may oversimplify complex decision structures.

In contrast, AHP–TOPSIS provides a more structured and multi-layered evaluation process. AHP ensures the derivation of criteria weights through pairwise comparisons accompanied by consistency validation, thereby reducing subjectivity and increasing reliability. This feature is particularly critical in decision environments where criteria importance is not uniform. Furthermore, TOPSIS introduces a dual-distance evaluation mechanism that measures the relative closeness of alternatives to both positive and negative ideal solutions. This dual-perspective assessment is consistently reported in the reviewed literature as producing more discriminative and realistic rankings compared to single-direction scoring methods.

A cross-study synthesis indicates that this methodological combination is especially effective in handling trade-offs among conflicting criteria, a characteristic frequently encountered in real-world decision-making scenarios such as supplier selection, employee evaluation, and location determination. Compared to SAW and WP, which assume linear and compensatory relationships among criteria, AHP–TOPSIS offers a more robust analytical framework that captures the complexity of decision contexts.

However, this superiority is accompanied by increased computational complexity and methodological requirements. The implementation of AHP–TOPSIS involves multiple stages, including matrix construction, consistency checking, normalization, and distance calculation. This implies a trade-off between analytical rigor and computational efficiency. Nevertheless, the majority of studies reviewed argue that this additional complexity is justified by the improved transparency, accountability, and robustness of the decision outcomes.

The effectiveness of AHP in Decision Support Systems has also been demonstrated in employee performance evaluation and selection problems. Inafaha reported that an AHP-based Decision Support System improved objectivity, transparency, and consistency in selecting high-performing employees through structured pairwise comparisons and consistency ratio evaluation. The study confirmed that AHP remains a reliable weighting method for multi-criteria decision-making environments and can serve as a strong foundation for hybrid approaches such as AHP–TOPSIS.

Another important finding emerging from this review is the relative position of AHP–TOPSIS compared to more advanced hybrid methods such as Fuzzy AHP–TOPSIS and AHP–TOPSIS–Borda. Although these methods offer enhanced capabilities in handling uncertainty and group decision-making, their adoption remains limited and context-specific. This suggests that, despite the availability of more sophisticated approaches, the standard AHP–TOPSIS framework continues to dominate due to its balance between methodological rigor and practical applicability.

Unlike previous studies that focus on single-case implementations, this review provides a broader cross-domain comparison, demonstrating that the analytical structure of AHP–TOPSIS remains consistent across different application areas. This consistency highlights the method's adaptability and supports its generalizability in Decision Support System research. Overall, the comparative findings reinforce the position of AHP–TOPSIS as a stable, widely accepted, and versatile MCDM approach in both academic and practical contexts.

The findings of this review are also consistent with recent Decision Support System studies published in JISTR. Previous studies have shown that decision-support frameworks integrated with analytical intelligence and systematic evaluation mechanisms can improve the quality, transparency, and reliability of decision-making processes. This observation supports the argument that structured decision-making approaches, including AHP–TOPSIS, remain highly relevant in addressing complex decision environments.

3.5 Limitations and Future Research

Despite the comprehensive findings, this study is subject to several limitations that should be considered when interpreting the results. First, the scope of the review is limited to journal articles indexed in Google Scholar, Garuda, and SINTA databases. The exclusion of major international indexing platforms such as Scopus and Web of Science may restrict the global representativeness of the findings. As a result, certain high-impact studies and emerging methodological developments may not be fully captured.

Second, this review focuses exclusively on journal publications, thereby excluding conference proceedings, technical reports, and other forms of grey literature. While this approach ensures the inclusion of peer-reviewed studies, it may also limit the diversity of perspectives, particularly in rapidly evolving research areas where innovative methods are often first introduced in non-journal formats.

Third, although the analysis identifies dominant trends and methodological patterns, it does not quantitatively evaluate the performance of AHP–TOPSIS against other MCDM methods using standardized metrics. Future studies could address this limitation by incorporating meta-analysis techniques or experimental comparisons to provide more objective performance benchmarking.

Based on these limitations, several directions for future research can be proposed. Expanding the data sources to include international databases such as Scopus and Web of Science would enhance the comprehensiveness and generalizability of the findings. Additionally, future research should explore the integration of AHP–TOPSIS with emerging approaches such as fuzzy logic, machine learning, and probabilistic models to address uncertainty and dynamic decision environments more effectively. Moreover, there is a need for more comparative and empirical studies that systematically evaluate the performance of different MCDM methods across various domains. Such studies would provide deeper insights into the conditions under which AHP–TOPSIS performs optimally compared to alternative approaches.

3.6 Research Implications

The findings of this systematic literature review provide important implications for both theoretical development and practical implementation in the field of Decision Support Systems. From a theoretical perspective, this study confirms the continued relevance and dominance of hybrid MCDM approaches, particularly the integration of AHP and TOPSIS. The consistent methodological pattern identified across the reviewed studies indicates a strong complementarity between criteria weighting (AHP) and alternative ranking (TOPSIS). Similar findings were reported by Inafaha, who demonstrated that AHP contributes to objective and transparent decision-making by providing measurable criteria weights and consistency validation mechanisms in employee performance evaluation systems. This reinforces the conceptual foundation that combining hierarchical structuring with distance-based evaluation enhances decision accuracy and analytical robustness.

In addition, the increasing trend of AHP–TOPSIS applications observed in recent years reflects a broader shift toward more structured and transparent decision-making models. This suggests that future theoretical advancements should focus on extending the framework to accommodate uncertainty, dynamic data, and multi-stakeholder environments. The incorporation of fuzzy sets, interval data, and hybrid intelligent systems represents a promising direction for improving the flexibility and applicability of MCDM methods.

From a practical perspective, the results provide clear guidance for decision-makers and system developers in selecting appropriate methodologies. The dominance of AHP–TOPSIS across diverse application domains such as education, human resource management, industry, and infrastructure demonstrates its adaptability and reliability in real-world scenarios. Practitioners can leverage this method to develop decision support systems that are not only accurate but also transparent and accountable.

Furthermore, the comparative findings suggest that while simpler methods such as SAW and WP may be suitable for less complex problems, AHP–TOPSIS is more appropriate for decision contexts involving multiple conflicting criteria and higher levels of uncertainty. This highlights the importance of aligning methodological choice with problem complexity and decision requirements. Overall, this study emphasizes that methodological rigor, transparency, and contextual suitability are critical factors in the development of effective decision support systems. By integrating insights from previous studies and identifying current research trends, this review contributes to a more comprehensive understanding of how AHP–TOPSIS can be effectively utilized and further developed in future research.

4. CONCLUSION

This study confirms that AHP–TOPSIS is a dominant and robust hybrid MCDM approach in Decision Support Systems, particularly for multi-criteria problems requiring both structured weighting and objective ranking. The increasing adoption after 2020 reflects a broader shift toward data-driven and transparent decision-making, driven by the growing complexity of decision environments in the Industry 4.0 and 5.0 era. Theoretically, this study highlights the methodological strength of AHP–TOPSIS as a complementary framework that integrates subjective judgment and objective evaluation in a consistent manner. Practically, its widespread application across domains demonstrates its adaptability and reliability, although its computational complexity remains a key consideration. However, the current literature is still limited in cross-domain generalization and quantitative comparison with other MCDM methods. Future research should focus on expanding empirical validation, incorporating international datasets, and integrating AHP–TOPSIS with advanced approaches such as fuzzy logic and intelligent systems to enhance its capability in handling uncertainty and dynamic decision contexts.

5. ACKNOWLEDGEMENTS

The authors would like to express their sincere gratitude to the Postgraduate Faculty of Technology and Vocational Education, State University of Surabaya, for their academic guidance and support throughout this study, as well as to the lecturers, academic supervisors, and all researchers whose work was reviewed in this article, whose insights, suggestions, and scholarly contributions were invaluable in conducting a systematic, transparent, and comprehensive review of AHP–TOPSIS applications in Decision Support Systems; appreciation is also extended to the providers of academic databases and indexing platforms, including Google Scholar, Garuda, SINTA, and other scientific sources, which greatly facilitated the identification, selection, and analysis of relevant literature, and finally, the authors thank all parties who contributed directly or indirectly to the successful completion of this research.

6. REFERENCES

[1] T. L. Saaty, “Decision making with the analytic hierarchy process,” *Int. J. Services Sciences*, 2008. DOI: https://doi.org/10.1504/IJSSCI.2008.017590

[2] C.-L. Hwang and K. Yoon, *Multiple Attribute Decision Making: Methods and Applications*. Berlin, Germany: Springer, 1981.

[3] M. Abdel-Basset, R. Mohamed, and V. Chang, “A multi-criteria decision-making framework to evaluate the impact of Industry 5.0 technologies: Case study, lessons learned, challenges and future directions,” *Information Systems Frontiers*, vol. 27, no. 2, pp. 791–821, Apr. 2025,doi: https://doi.org/10.1007/s10796-024-10472-3

[4] M. D. Irawan and M. R. Fasya, “Kombinasi AHP–TOPSIS untuk pemilihan dosen terbaik berdasarkan metrik SINTA,” *Sistem Pendukung Keputusan dengan Aplikasi*, vol. 3, no. 1, pp. 1–12, Mar. 2024, doi: https://doi.org/10.55537/spk.v3i1.751

[5] A. Kolios, V. Mytilinou, E. Lozano-Minguez, and K. Salonitis, “A comparative study of multiple-criteria decision-making methods under stochastic inputs,” Energies, vol. 9, no. 7, p. 566, 2016, doi: https://doi.org/10.3390/en9070566.

[6] S. H. Zanakis, A. Solomon, N. Wishart, and S. Dublish, “Multi-attribute decision making: A simulation comparison of select methods,” *European Journal of Operational Research*, 1998, doi: 10.1016/S0377-2217(97)00147-1.

[7] M. Z. Katili, L. N. Amali, and M. S. Tuloli, “Implementasi metode AHP–TOPSIS dalam sistem pendukung rekomendasi mahasiswa berprestasi,” *Jambura Journal of Informatics*, vol. 3, no. 1, 2021, doi: https://doi.org/10.37905/jji.v2i2.10246

[8] O. Sahin and B. Aksoy, “A combined AHP–TOPSIS-based decision support system for highway pavement type selection,” *Sustainability*, vol. 17, no. 21, Nov. 2025, doi: https://doi.org/10.3390/su17219396

[9] Y. Liu *et al.*, “Multi-criteria decision-making framework (AHP–TOPSIS): Pavement preventive maintenance case study for ordinary national trunk highways,” *Buildings*, vol. 14, no. 10, Oct. 2024, doi: 10.3390/buildings14103048

[10] D. I. Handayani *et al.*, “The future of supplier selection: Integrating bibliometric intelligence and MCDM in the perishable agro-industry,” *Jurnal Manajemen dan Agribisnis*, vol. 22, no. 2, p. 158, Jul. 2025, doi: https://doi.org/10.17358/jma.22.2.158

[11] Y. Liu, G. Li, and T. Zhang, “A hybrid AHP–TOPSIS method for evaluating sustainable supply chain performance,” Sustainability, vol. 13, no. 3, 2021.

[12] A. Mardani, A. Jusoh, K. M. D. Nor, Z. Khalifah, N. Zakwan, and A. Valipour, “Multiple criteria decision-making techniques and their applications: A review of the literature from 2000 to 2014,” *Economic Research–Ekonomska Istraživanja*, Sep. 2015

[13] R. Kumar and D. Pamucar, “A comprehensive and systematic review of multi-criteria decision-making (MCDM) methods to solve decision-making problems: Two decades from 2004 to 2024,” Spectrum of Decision Making and Applications, vol. 2, no. 1, pp. 177–196, 2025. doi: https://doi.org/10.31181/sdmap21202524

[14] E. K. Zavadskas et al., “Hybrid multiple-criteria decision-making methods: A review of applications in engineering,” Scientia Iranica, vol. 23, no. 1, pp. 1–20, 2016.

[15] S. Kumar et al., “A hybrid AHP–TOPSIS framework for evaluating smart city development,” Sustainable Cities and Society, vol. 75, 2021.

[16] X. Wang and Q. Duan, “Improved AHP–TOPSIS model for the comprehensive risk evaluation of oil and gas pipelines,” Petroleum Science, vol. 16, no. 6, pp. 1479–1492, 2019.

[17] M. Keshavarz-Ghorabaee et al., “A systematic review of MCDM applications in sustainability problems,” Sustainability, vol. 14, 2022.

[18] Ningsiah, N. Aminudin, S. Ariyanti, and R. Abbasov, “An Intelligence-Oriented System Architecture for Integrated Pharmaceutical Data Analytics and Decision Support,” Journal of Information System and Technology Research, vol. 5, no. 1, pp. 34–43, Jan. 2026 DOI: 10.55537/jistr.v5i1.1461

[19] I. Fajar, S. R. Yahya, F. A. Bohani, and N. N. Yusof, “A Web-Based Decision Support System for Inventory Procurement Optimisation Using Pareto Analysis,” Journal of Information System and Technology Research, vol. 5, no. 1, pp. 157–167, Jan. 2026 DOI: 10.55537/jistr.v5i1.1447

[20] A. P. R. Pinem, A. Hendrawan, and N. Wakhidah, “The comparative analysis of multi-criteria decision-making methods (MCDM) in priorities of industrial location development,” Infotel, vol. 16, no. 4, pp. xx–xx, Dec. 2024, doi: https://doi.org/10.20895/infotel.v16i4.1099

[21] R. Govindan and M. Jepsen, “Supplier selection using hybrid MCDM approaches: A systematic review,” Transportation Research Part E, vol. 148, 2021.

[22] M. Sequeira, A. Adlemo, and P. Hilletofth, “A hybrid fuzzy AHP–TOPSIS model for evaluation of manufacturing relocation decisions,” *Operations Management Research*, vol. 16, no. 1, pp. 164–191, Mar. 2023, doi: https://doi.org/10.1007/s12063-022-00284-6

[23] V. Bafandegan Emroozi, M. Kazemi, A. Pooya, and M. Doostparast, “Evaluating human error probability in maintenance task: An integrated system dynamics and machine learning approach,” *Human Factors and Ergonomics in Manufacturing & Service Industries*, Oct. 2024, doi: https://doi.org/10.1002/hfm.21057

[24] B. Kitchenham and S. Charters, Guidelines for Performing Systematic Literature Reviews in Software Engineering. Keele University and Durham University Joint Report, 2007.

[25] M. J. Page et al., "The PRISMA 2020 statement: An updated guideline for reporting systematic reviews," BMJ, vol. 372, n71, 2021, doi: https://doi.org/10.1136/bmj.n71

[26] N. F. Husnaini, "Sistem pendukung keputusan berbasis web dengan metode AHP–TOPSIS untuk pengukuran tingkat kesejahteraan masyarakat pesisir," *Computer Journal*, vol. 3, no. 1, pp. 51–60, Feb. 2025, doi: https://doi.org/10.58477/cj.v3i1.204

[27] R. D. Mainingsih, M. Hamka, "Sistem pendukung keputusan untuk menentukan penerima bantuan beasiswa dengan metode AHP dan TOPSIS," vol. 18, no. 1, 2021.

[28] W. Chanpuypetch, J. Niemsakul, W. Atthirawong, and T. Supeekit, "An integrated AHP–TOPSIS approach for bamboo product evaluation and selection in rural communities," *Decision Analytics Journal*, vol. 12, Sep. 2024, doi: https://doi.org/10.1016/j.dajour.2024.100503

[29] D. M. Inafaha, "Simulasi Sistem Pendukung Keputusan Berbasis Analytic Hierarchy Process (AHP) sebagai Alat Bantu Seleksi Karyawan Berprestasi," *Journal of Education and Informatics Research*, vol. 6, no. 2, pp. 67–75, 2025. Doi : https://doi.org/10.21107/jedumatic.v6i2.31918

[30] L. Isyriyah *et al.*, "Sistem pendukung keputusan penentuan lokasi usaha kuliner menggunakan metode AHP dan TOPSIS," *Jurnal Teknologi dan Manajemen Informatika*, vol. 10, no. 2, pp. 176–186, 2024.

[31] N. B. Puspitasari and V. Febriani, "Integration of the AHP–TOPSIS approach in material supplier selection," in *E3S Web of Conferences*. EDP Sciences, Apr. 2024, doi: https://doi.org/10.1051/e3sconf/202451706005

[32] H. Nouib *et al.*, "Predicting graduate employability using hybrid AHP–TOPSIS and machine learning: A Moroccan case study," *Technologies*, vol. 13, no. 9, Sep. 2025, doi: https://doi.org/10.3390/technologies13090385