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AHP-TOPSIS FOR MITIGATING GROUPTHINK IN DECISION-MAKING: A SYSTEMATIC LITERATURE REVIEW

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Groupthink in group decision-making can hinder objectivity and result in suboptimal decisions. This study proposes the integration of the Analytical Hierarchy Process (AHP) and Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) methods in a Decision Support System (DSS) to reduce groupthink bias. AHP is used to systematically determine the weight of criteria, while TOPSIS allows ranking alternatives based on proximity to the ideal solution. This combination of methods ensures decisions are more transparent, data-driven, and not influenced by group pressure. The success of implementing an AHP-TOPSIS-based DSS is influenced by data quality, stakeholder diversity, and data-driven management and organizational culture support. This study shows that an AHP-TOPSIS-based DSS can improve accuracy, accountability, and decision-making effectiveness. Thus, this approach provides more objective and structured solutions in complex and dynamic organizational environments. A total of 40 articles reviewed in this literature review study demonstrate the use of DSS in various decision-making processes across different fields. The AHP, TOPSIS methods, or their combination can produce objective, accurate decisions that integrate multiple dimensions.

Keywords: AHP; Decision Support System; groupthink; decision-making; TOPSIS.

The continuous changes in the business environment require every company to have a competitive advantage and become globally competitive. To face increasingly tight competition, the latest innovations are needed to read consumer characteristics and market dynamics, to support a careful and precise decision-making process. In the decision-making process, several systematic options or alternatives are followed up in solving a problem or determining a strategy for the future. Making a quality decision can be challenging because internal and external factors often influence it. Several factors can influence decision-making, one of which is groupthink. In certain situations, a tool is needed so that the results of the decision-making are as expected. A Decision Support System (DSS) can be an effective tool to overcome this challenge and support better decision-making, particularly in situations where groupthink influences are present.

Through the appropriate Decision Support System (DSS), various analyses, information, recommendations, and scenario simulations can be provided for policymakers (Elkady et al., 2024). DSS can contribute to more objective and evidence-based decision-making by mitigating the inherent subjectivity and normativity that can affect human analysis during the decision-making process. Some methods that are often used in DSS to improve the objectivity and effectiveness of decisions are the Analytic Hierarchy Process (AHP) and the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS). AHP helps hierarchically determine the weight of criteria based on decision makers' preferences. On the other hand, through a comprehensive comparative study between several ideal alternatives, TOPSIS can offer the best solution. In a groupthink situation that can provide cognitive bias, combining AHP and TOPSIS is beneficial in making decisions based on a systematic and consistent approach. This article examines the benefits of the AHP and TOPSIS methods in decision-making contexts where groupthink influences are present. Several studies have shown that combining AHP and TOPSIS effectively supports various decision-making processes, such as selecting suppliers based on specific criteria (Meron & Ravi, 2022). In addition, this method has also been applied in decision-making related to women's empowerment, where the combination of AHP-TOPSIS provides a systematic and data-based framework (Adhikari et al., 2023).

Research Gap:

Several studies have focused on identifying and assessing the impact of groupthink in decision-making. However, not many have examined decision support system (DSS)-based mitigation strategies using the

AHP and TOPSIS methods. This article is expected to fill this gap through the Systematic Literature Review (SLR) approach to identify empirical evidence and provide deeper insight into how AHP-TOPSIS-based DSS can systematically reduce groupthink bias.
Research Questions:
1. How can the AHP-TOPSIS method be integrated into a decision-support system to reduce groupthink bias in group decision-making?
2. What factors influence the success of implementing an AHP-TOPSIS-based DSS in reducing groupthink in an organization or company?

LITERATURE REVIEW

The AHP (Analytic Hierarchy Process) method was proposed by Thomas L. Saaty, which aims to determine the best choice from several alternatives in a process that includes several criteria (Araujo et al., 2023). The method is based on the dissolution and synthesis of relationships between criteria according to a scale until the priority of the indicators is obtained, and ultimately, the results obtained approach the best performance measurement response.
The advantage of the AHP method is that it allows users to assign relative weights to several attributes or alternatives for a particular attribute while making peer-to-peer comparisons. The advantage of AHP is that it can provide a comprehensive and rational framework for structuring decision-making problems. AHP is used to break down a complex, unstructured situation into several components in a hierarchical arrangement, by giving subjective values about the relative importance of each variable, and determining which variables have the highest priority to influence the results in the situation. The following are the steps in the AHP method (Deretarla et al., 2023):
a. Hierarchy Formation: The first step in AHP is constructing a hierarchy, which is a structural representation of the decision-making problem. The hierarchy consists of several levels, from the main objective (e.g., the organization's strategic objective) to the criteria (e.g., cost, quality, time), sub-criteria (e.g., cost-effectiveness, durability, speed), and alternatives (e.g., product A, product B, product C).
b. Pairwise Comparison Matrix Assessment: compares various criteria and subcriteria as a basis for establishing initiatives to achieve higher goals in a predetermined hierarchy. This active participation is crucial in shaping the AHP process.
c. Priority (eigenvector) Calculation: AHP uses mathematical calculations to transform the pairwise comparison assessments into relative priorities for each element in the hierarchy. This involves calculating eigenvectors (a vector that does not change its direction during a linear transformation) and eigenvalues (a scalar that represents the amount that the eigenvector is scaled during the transformation) to obtain the relative weights of each level in the hierarchy.
d. Decision-Making Consistency: During the evaluation process, AHP checks the consistency of decision-making to ensure that the pairwise comparison assessments made by the user are consistent.
e. Decision Making: Once the relative priorities of each element in the hierarchy are calculated, AHP integrates this information to determine the best alternative based on the stated objective.
Technique for Others Reference by Similarity to Ideal Solution (TOPSIS). This method is one of the multicriteria decision-making methods introduced by Yoon and Hwang, which provides compliance with unconstrained criteria to evaluate unconstrained outcomes (Araujo et al., 2023). The underlying logic of TOPSIS is that the selected alternative should have the closest distance to the positive ideal solution and the farthest from the negative ideal solution from a geometric point of view, using the Euclidean distance to determine the relative proximity of an alternative to the optimal solution (Marzouk et al., 2021).
The optimal solution in the TOPSIS method is obtained by determining the relative proximity of an alternative to the positive ideal solution. Although TOPSIS has weaknesses, it does not always provide good options; on the contrary, TOPSIS provides the closest alternative that is considered the best. Thus, if one decision maker gives a score for each alternative, the result will be a ranking of alternatives based on that score. If other decision-makers give different scores, then the ranking of the options will also be different. Therefore, TOPSIS assesses the right solution by considering the perspective of each decision-maker (Marzouk et al., 2021). According to Chakraborty et al. (2023), the steps in implementing the TOPSIS method are as follows:
a. Establishing a decision matrix and assigning weights to the selected criteria
b. Normalizing the decision matrix as a requirement for the next stage
c. Calculating the normalized decision matrix
d. Determining the benefit criteria
e. Evaluating the differentiation of each alternative
f. Evaluating the relative proximity or proximity of each alternative to the ideal solution.

To support the strategic decision-making process, balance and uniformity are needed between the organization's internal capabilities in dealing with external dynamics. This will require a comprehensive review of the various solutions available to choose the best option that supports competitive advantage and organizational instinct (Bhushan & Rai, 2004). Yu and Raksong in Tarmo (2020) stated that decision-making is an important process for every organization and is closely related to the company's overall performance. Strategic decisions are made by considering developments that affect the organization, optimizing resources, taking advantage of opportunities, and increasing competitiveness. Therefore, organizations must be able to make decisions quickly and accurately to adapt to environmental changes and achieve their stated goals. Decision-making involves selecting the best or most relevant alternatives to enhance overall performance by integrating the information obtained to address emerging challenges and succeed in business competition (Baron and Byrne, 2008). As shown in Figure 1, a comprehensive study of various threat or competition factors is needed in the decision-making process, so that several scientifically based strategy options can be proposed as alternative solutions. The strategy is then further evaluated to determine the best implementation strategy. A structured mechanism is needed to ensure the chosen strategy effectively deals with crises and emergencies.

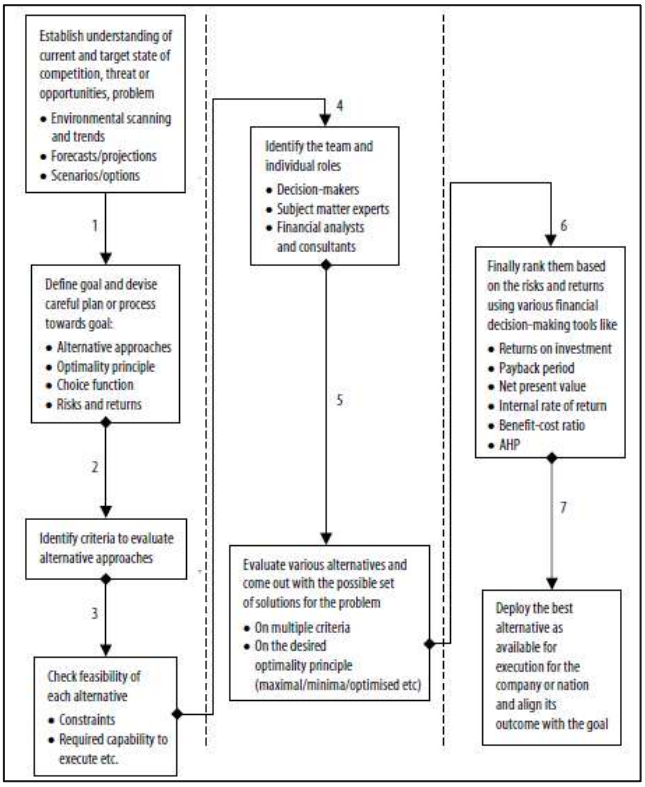

FIGURE 1 Strategic Decision-Making Process (Bhushan & Rai, 2004)

Groupthink is one of the most well-known theories in the study of group decision-making failures and is often uncritically considered a significant cause of many policy-making failures (Kowert, 2002). Groupthink theory refers to the forced conformity of thought within a group that suppresses diversity of views and inhibits critical thinking. This psychological phenomenon is common in various communities, including religion, politics, business, medicine, and geology (Shanmugam, 2022). According to West and Turner, as cited by Pamungkas et al. (2018), groupthink refers to a pattern of collective thinking in which the desire to reach consensus overrides the motivation to critically evaluate decisions. Furthermore, groupthink influences decision-making through stereotyping and various other mechanisms that can limit rationality in the decision-making process (Charles, 2024).

Groupthink is a phenomenon that occurs when individuals in a group tend to agree with decisions without engaging in critical reasoning or in-depth evaluation of the alternatives (Baptis, 2015; Janis, 1991). According to Wexley & Yukl (1984), there are several main symptoms of groupthink, namely:

a. Illusion of invulnerability, an excessive belief that the group cannot make mistakes.
b. Rationalizing negative information, rejecting or ignoring facts that contradict group decisions.
c. Stereotyping of out-groups, holding negative views of individuals or groups outside the leading group.

d. The assumption of group morality is the belief that group decisions are always moral and correct without considering their ethical impact.
e. Self-censorship is the group members' reluctance to express differing opinions to avoid conflict.
f. Illusion of unanimity, the belief that all group members agree, even though there are unspoken differences of opinion.
g. Mind-guards are individuals in a group who actively filter or limit information that could disrupt group consensus.
h. Direct social pressure, coercion, or pressure on members who express differing opinions to conform to the group.

Groupthink occurs in highly cohesive groups, where members tend to underestimate others, overestimate their own power, and cling to erroneous beliefs without considering objective reality (Caya, 2015). Individuals in highly cohesive groups tend to ignore alternatives or other points of view to reach a consensus during the decision-making process. The concept of groupthink is based on three main assumptions: (1) groups with high levels of cohesion are more susceptible to groupthink; (2) problem-solving in groups is an integrated process in which members influence each other in forming decisions; and (3) group decision-making is a complex activity, influenced by a variety of psychological and social factors.

METHODS

This study employs a systematic literature review approach by consulting various academic sources from reputable journal databases, both national and international. The databases used include Google Scholar (scholar.google.com), Publish or Perish (https://publish-or-perish.en.softonic.com), and ScienceDirect (www.sciencedirect.com). Some considerations in selecting the database include ease of access and completeness of search features that support the search for relevant articles. The research steps taken are as follows:

1. Determination of keywords as a basis for sorting and selecting articles that can be accessed from the established database

In this study, the keywords used are "AHP", "TOPSIS", "AHP-TOPSIS", "groupthink", and "decision making"

2. Literature Search

The search for articles was carried out at different time intervals according to the relevance of the topic:

a. AHP, TOPSIS, and AHP-TOPSIS: articles from 2020 to 2025
b. Groupthink: This study considered articles from 2011 to 2025, considering that groupthink is highly relevant and continues to develop in various disciplines. A more extended period allows for a more comprehensive analysis and its application in the current context.
c. Decision Making: articles from 2020 to 2025

Around 2,632 articles were screened and selected at the beginning of the search.

3. Article Screening and Selection

Further screening of the articles that have been obtained is carried out based on keywords, such as related themes, completeness of the article, ranking of the journal or publisher, and research methodology used. This stage reduced the scope of the number of articles so that 48 articles were produce.

4. Literature Analysis and Synthesis

The selected articles were analyzed using a thematic and comparative approach, focusing on applying AHP and TOPSIS methods in decision-making, the significance of the groupthink concept in decision contexts, and the integration of various models in decision-making to assess their impact on the organization

RESULT AND DISCUSSION

Decision-making involves considering the development of situations that affect the organization to optimize resources, utilizing opportunities from several available choices. To minimize the influence of groupthink in the decision-making process, DSS can be used as a tool to help make decisions based on objective assessment and analysis. Table 1 below presents the articles selected as references in this study, choosing the topics of AHP and TOPSIS as decision-making tools in situations of groupthink influence.

TABLE 1 DSS studies in various scientific articles

No	Title	Variables	Benefits of DSS in Decision-making	Advantages of DSS Method	Results
1	A Strong Sustainability Paradigm-based Analytical Hierarchy Process (SSP-AHP) method to evaluate sustainable healthcare systems (Watrobski, et al., 2023)	AHP and Decision-making	This method supports the decision-making process related to health policy.	Combining methods provides a comprehensive and transparent performance measurement and reporting assessment	The SSP-AHP method, as a new tool for evaluating the sustainability of health systems, focuses on social sustainability.
2	An integrated best–worst method and fuzzy TOPSIS for resilient-sustainable supplier selection (Varchandi et al., 2024)	TOPSIS	This method supports the decision-making process in supplier selection.	The TOPSIS method helps make comprehensive, efficient, accurate, and flexible decisions.	It is a practical solution for companies to make informed and balanced selection decisions.
3	Using AHP-TOPSIS methodologies in the selection of sustainable suppliers in the electronics supply chain (Menon et al., 2022)	AHP and TOPSIS	Combining AHP and TOPSIS methods helps companies select suppliers based on criteria and weighting	The combination of AHP and TOPSIS methods helps make comprehensive, practical, systematic decisions by outlining problems and ranking solutions.	Companies can make more informed and balanced decisions when selecting suppliers.
4	Efficient fuzzy multi-criteria decision-making for optimal college location selection: A comparative study of min–max fuzzy TOPSIS Approach (Sahoo et al., 2024)	MCDM and TOPSIS	Combining MCDM and TOPSIS methods helps evaluate potential locations and make more objective and informed decisions.	Combining AHP and TOPSIS methods helps make efficient, accurate, and systematic decisions.	The TOPSIS fuzzy min-max approach has proven effective in selecting optimal university locations more efficiently and accurately considering various criteria.
5	Empowerment of women in India as different perspectives based on the AHP-TOPSIS inspired multi-criterion decision making method (Adikari et al., 2023)	AHP and TOPSIS	The combination of AHP and TOPSIS methods provides a systematic and objective framework for decision-making related to women's empowerment.	Combining AHP and TOPSIS methods helps in objective, systematic, and comprehensive decision-making by combining essential factors that influence	The AHP-TOPSIS method has proven effective in assessing and ranking various aspects of women's empowerment.

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				women's empowerment.	
6	Supplier selection in green supply chain management using correlation-based TOPSIS in a q-rung orthopair fuzzy soft environment (Zulqarnain et al., 2024)	TOPSIS	This method provides a more robust framework for evaluating suppliers based on environmental and performance criteria.	This method is more comprehensive and better at handling data uncertainty.	The TOPSIS approach has proven effective in selecting appropriate suppliers in green supply chain management.
7	Cobot selection using a hybrid AHP-TOPSIS-based multi-criteria decision-making technique for the fuel filter assembly process (Sivalingam et al., 2024)	AHP and TOPSIS	The combination of AHP and TOPSIS methods provides a systematic framework for evaluating and selecting cobots based on various criteria such as cost, efficiency, and capability.	Combining AHP and TOPSIS methods helps decision-making with a holistic, reliable, and accurate approach.	The AHP-TOPSIS method has proven effective in selecting the most suitable cobot for the fuel filter assembly process.
8	A multicriteria approach for biomass availability assessment and selection for energy production in Burkina Faso: A hybrid AHP-TOPSIS approach (Zoma et al., 2023)	AHP and TOPSIS	The combination of AHP-TOPSIS methods helps to identify and assess biomass availability from various sources and select the most suitable biomass sources for energy production based on spesific criteria.	Integrating AHP and TOPSIS allows a comprehensive analysis of various criteria in decision-making. It also allows for modeling the preferences of different stakeholders regarding biomass source choices.	The AHP-TOPSIS approach effectively evaluates and selects biomass sources for energy production and supports sustainable energy policies and infrastructure development in Burkina Faso.
9	A comparison between fuzzy AHP and fuzzy TOPSIS methods to software requirements selection (Nazim et al., 2022)	Fuzzy AHP dan Fuzzy TOPSIS	Combining Fuzzy AHP and Fuzzy TOPSIS methods helps handle uncertainty in assessing and ranking alternatives.	Combining methods helps make decision-making systematic, flexible, and easy to implement, and overcomes uncertainty and ambiguity in assessment.	Helping decision-makers in the software industry to choose the method that best suits their specific context and needs.
10	Optimal landfill site selection using ArcGIS Multi-Criteria Decision-Making (MCDM) and Analytic	ArcGIS, AHP, and MCDM	The combination of methods helps visualize and evaluate various geographic and	The combination of ArcGIS, AHP, and MCDM methods helps	A significant contribution was made to urban waste management

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	Hierarchy Process (AHP) for Kinshasa City (Kang et al., 2024)		environmental factors and evaluate and integrate various criteria relevant to decision-making.	decision-making in an integrated, accurate, and transparent manner.	with a holistic and integrated approach, which could be a model for other cities facing similar challenges in waste management.
11	AHP-TOPSIS social sustainability approach for selecting supplier in construction supply chain (Marzouk et al., 2021)	AHP and TOPSIS	Combining the AHP and TOPSIS methods helps solve problems related to ranking and selecting ideal suppliers.	With an integrated, transparent, and systematic AHP approach and TOPSIS, which supports an objective ranking process, holistic decisions can be made.	The AHP-TOPSIS approach is an effective and efficient tool for supplier selection that considers social sustainability in the construction supply chain.
12	Use of the AHP methodology in system dynamics: Modelling and simulation for health technology assessments to determine the correct prosthesis choice for hernia diseases (Improta et al., 2018)	AHP	The AHP method helps solve problems through an easy-to-understand hierarchical process and transparent and consistent preference-based criteria assessment.	With an integrated approach, providing a more comprehensive analysis through realistic modeling and evidence-based decision-making.	The integrated AHP method effectively evaluates health technology in selecting the appropriate prosthesis for hernia disease.
13	An integrated Analytic Hierarchy Process and Complex Proportional Assessment for vendor selection in supply chain management (Deretarla et al., 2023)	AHP, CPA (and Complex Proportional Assessment)	Combining AHP and CPA methods provides a comprehensive decision-making framework and reduces subjective bias.	The combination of methods allows for a comprehensive assessment of multiple criteria and can be used to deal with complexity and uncertainty.	This combination of AHP and CPA can help organizations make better, more informed decisions about selecting the most suitable vendor.
14	An integrated multiple-criteria decision-making and data envelopment analysis framework for efficiency assessment in sustainable healthcare systems (Erdebili et al., 2024)	MCDM, DEA, and TOPSIS	The combination of MCDM, DEA, and TOPSIS methods provides a clear framework that helps the evaluation process be in-depth and	The combination of MCDM, DEA, and TOPSIS methods allows for a comprehensive evaluation. It identifies best	Significant contributions were made in developing an integrated framework for evaluating efficiency in

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			comprehensive and minimizes subjectivity.	practices with a mathematical approach to support more objective decision-making (Erdebili et al., 2024)	sustainable health systems.
15	Evaluation of smart and sustainable cities through a hybrid MCDM approach based on ANP and TOPSIS technique (Ozkaya et al., 2020)	ANP and TOPSIS	The hybrid ANP-TOPSIS approach allows for handling the complexity and interrelationships between criteria and selecting optimal alternatives.	The ANP-TOPSIS hybrid approach provides a comprehensive and systematic study and objective selection, thereby reducing subjectivity in decision-making.	The ANP-TOPSIS approach can be successfully applied in the context of smart and sustainable city evaluation.
16	Quantum computing challenges in the software industry. A fuzzy AHP-based approach (Awan et al., 2022)	AHP	The AHP method provides a systematic framework for evaluating various aspects and criteria in the context of quantum computing decision-making.	An integrated approach provides systematic, flexible, and relevant decisions to address the challenges.	The Fuzzy AHP approach can address the complexity and uncertainty in decision-making related to quantum computing in the software industry and provide a robust framework for evaluating and prioritizing optimal strategies in the face of ongoing technology evolution.
17	Decision-making for community resilience: A review of decision support systems and their applications (Elkady et al., 2024)	Decision-making	DSS helps integrate complex data, analyze information from multiple sources, and provide measurable solutions to support more timely and effective decisions.	The DSS approach can integrate existing information, supporting flexible decision making.	Decision support systems (DSS) strengthen community resilience through informed, data-driven decision-making.
18	A method for selecting processes for	AHP and TOPSIS	AHP and TOPSIS provide a	Combining AHP and	This method provides a

No	Title	Variables	Benefits of DSS in Decision-making	Advantages of DSS Method	Results
	automatic with AHP and Topsis (Costa et al., 2023)		systematic and structured framework for evaluating various processes and determining automation priorities.	TOPSIS offers a robust methodological approach to produce more reliable and valid decisions.	systematic, objective, and flexible framework that can be applied across industries to improve efficiency and productivity.
19	Penilaian Kinerja Karyawan Menggunakan Metode TOPSIS (Sukamto et al., 2021)	TOPSIS	The TOPSIS method provides a firm framework as a basis for decision-making.	The TOPSIS method can help users make decisions by ranking based on preferences.	The assessment system is based on criteria and performance ranking based on competence, professionalism, communication, management, and friendliness preferences.
20	Penggunaan Metode AHP dan Topsis dalam Pemilihan Penyedia Suku Cadang Instalasi Perawatan Sarana Rumah Sakit (Jufri et al., 2022)	AHP and TOPSIS	The AHP and TOPSIS methods provide a systematic and structured framework used in decision-making systems.	TOPSIS and AHP are quite familiar and easy to implement. They use a qualitative scale to become quantitative, so the decisions are objective.	Determination of several criteria in selecting suppliers, including S1 (Price), S2 (Quality), S3 (Delivery Speed), and S4 (Completeness)
21	Penerapan Metode Topsis Dalam Pemilihan Jasa Ekspedisi (Mutmainah et al., 2020)	TOPSIS	The TOPSIS method is used to select expedition service partners in decision-making	The TOPSIS method has a simple and easy-to-understand concept and can measure the relative performance of decision alternatives in a simple mathematical form.	To be more objective, selecting the best expedition service can be determined by searching for the distance value between the positive and negative solutions at PT Tachimita Hoka Utama.
22	TOPSIS and Modified TOPSIS: A comparative analysis (Chakraborty, 2022)	TOPSIS	The TOPSIS method can improve accuracy or relevance in different decision-making contexts.	The TOPSIS method provides a sharp comparative analysis of the series of strategies offered, capable of enriching insight into	This study provides valuable guidance for practitioners in utilizing the TOPSIS method and its variations effectively in various decision-

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				performance and practical implementation in the field.	making situations.
23	A multi-citeria decision making framework for residential building renovation using pairwise comparison and TOPSIS methods. (Amorocho et al., 2022)	TOPSIS	This framework provides a structured and systematic approach to evaluating various renovation alternatives, helping decision-makers to make better and more informed choices.	Using paired comparison methods and TOPSIS provides a strong and reliable methodological basis for complex decision-making.	A practical approach to residential building renovation decision-making based on various essential criteria such as cost, quality, and sustainability.
24	Using wearable technological devices to improve workplace health and safety: An assessment on a sector base with multi-criteria decision-making methods (Aksüt et al., 2024)	Wearable, MCDM, and AHP	The combination of Wearable, MCDM, and AHP methods helps in the evaluation and decision-making process based on real-time conditions and a clear structure that is easy to understand.	The combination of Wearable, MCDM, and AHP can provide comprehensive, flexible analysis and structured decision-making.	Wearable technology, such as AHP, can help monitor the physical condition of workers, detect risks early, and improve response to conditions as needed.
25	A comprehensive and systematic review of multi-criteria decision-making methods and applications in healthcare (Chakraborty et al., 2023)	MCDM	MCDM helps policymakers and health professionals to consider complex and often conflicting factors and criteria, such as clinical effectiveness, costs, quality of life, and patient preferences.	The MCDM reviewed in this article includes the ability to integrate quantitative and qualitative data, providing more holistic and informed solutions.	MCDM methods are vital in healthcare because they help deal with the complexity and uncertainty inherent in medical and managerial decision-making.
26	A study on fuzzy-AHP analysis for carbon neutrality in container terminals in Korea (Kim et al., 2025)	Carbon Neutral, Container Terminal, Delphi Survey, Factor Analysis, Fuzzy-AHP	Facilitating hierarchy-based decision-making with Fuzzy-AHP to identify priority factors in decarbonization strategies	AHP relies on expert subjectivity in weighting criteria and is sensitive to variable changes.	Fuzzy-AHP shows that regulation and legal systems are the main factors in achieving carbon neutrality, followed by energy efficiency and

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					low-carbon infrastructure.
27	Assessing the performance of machine learning and analytical hierarchy process (AHP) models for rainwater harvesting potential zone identification in hilly region, Bangladesh (Hasan et al., 2025)	Machine learning (ML) Analytical hierarchy process (AHP), Chattogram	Improving the accuracy of rainwater harvesting zone identification through a combination of ML (RF, BRT, KNN, NB) and AHP, assisting spatial data-based decision-making.	AHP has limitations in capturing the complexity of geospatial factors compared to ML; results depend on data availability and modeling accuracy.	The BRT and RF models performed best with an AUC of 0.93, while AHP had the lowest AUC of 0.82. Drainage density and elevation are the most influential factors in determining the optimal location of rainwater harvesting.
28	An integrated Pythagorean fuzzy delphi-AHP-CoCoSo approach for exploring barriers and mitigation strategies for sustainable supply chain in the food industry (N. Gupta et al., 2025)	Supply Chain, Pythagorean Fuzzy Set, Delphi Method, AHP, Barrier	Assist decision-makers in prioritizing key barriers and selecting the most effective mitigation strategies based on quantitative analysis.	AHP relies on the subjectivity of respondents in assigning weights; the accuracy of the results depends on the data quality and the fuzzy model used.	The Pythagorean fuzzy AHP and CoCoSo methods systematically identified and prioritized barriers and mitigation strategies.
29	Prioritization of key areas of the digitalization strategy of energy complex enterprises based on the Analytical Hierarchy Process/ AHP (Chernov et al., 2025)	Digital economy, Digitalization, Digitalization strategy, AHP, Energy companies	Helping energy companies prioritize digitalization initiatives to improve efficiency and competitiveness.	The AHP model has limitations in handling the complexity of relationships between variables.	Big data and artificial intelligence are identified as key elements in digital transformation strategies.
30	Analytic hierarchy process in transportation decision-making: A two-staged review on the themes and trends of two decades (Kriswardhana et al., 2025)	AHP, Bibliometric analysis, Systematic review, Hybrid models	AHP helps identify safety factors, select strategic locations, and evaluate the environmental impact of transportation.	AHP's limitations in handling complex relationships between variables; the subjectivity of the assessor can influence results in assigning weights.	AHP is used for transportation analysis, with sub-themes of infrastructure, location selection, and safety. Hybrid methods such as Fuzzy-AHP improve decision-making effectiveness in the transportation sector.

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31	Efficient fuzzy multi-criteria decision-making for optimal college location selection: A comparative study of min–max fuzzy TOPSIS approach (Sahoo et al., 2024)	MCDM, Min Max operation, TOPSIS	Reducing the complexity of pairwise comparison in fuzzy decision-making, and increasing the efficiency of alternative selection	Limitations in handling highly uncertain data and dependence on user-defined weight parameters.	The fuzzy TOPSIS min-max method effectively ranks alternatives, with validation through a college location selection case study.
32	Complex Fermatean fuzzy extended TOPSIS method and its applications in decision making (Zaman et al., 2023)	CFFS, MAGDM, TOPSIS, Average CFFEHA	Enables more accurate decision-making by considering objects' positive and negative aspects in an ambiguous environment.	High computational complexity and requires a deep understanding of complex Fermatean fuzzy theory.	The complex Fermatean fuzzy-based TOPSIS method improves decision accuracy in MAGDM, with validation through a case study of English instructor selection.
33	Selection of a vehicle for Brazilian Navy using the multi-criteria method to support decision-making TOPSIS-M (Araujo et al., 2023)	Multi-criteria method, TOPSIS-M, Decision Making	It allows the selection of the best vehicle based on an objective multi-criteria evaluation.	The accuracy of the results depends on the weight of the criteria set and the availability of valid data.	The TOPSIS-M method can identify the best vehicle for the Brazilian Navy, proving the effectiveness of this approach in selecting military vehicles.
34	TOPSIS-method based on generalized dice similarity measures with hamy mean operators and its application to decision-making process (Garg et al., 2023)	Complex Pythagorean fuzzy TOPSIS. Decision-making methods	Improves accuracy in handling ambiguous and uncertain data in decision-making.	The computational complexity is high and depends on correctly set parameters.	The CPF-based Hamy Mean operator improves the effectiveness of the TOPSIS method in MADM, showing high accuracy in numerical evaluation and geometric interpretation.
35	An evolutionary strategic weight manipulation approach for multi-attribute decision making: TOPSIS method (Dutta et al., 2021)	MADM, TOPSIS, Genetic optimization Non-linear	Identifying and addressing weight manipulation in decision making, improving transparency and reliability of results.	High complexity in solving MINLP and potential bias if the algorithm is not well calibrated.	Genetic algorithm-based methods effectively detect and optimize weights in TOPSIS

No	Title	Variables	Benefits of DSS in Decision-making	Advantages of DSS Method	Results
					MADM, improving decision accuracy underweight information uncertainty.
36	Multi-criteria decision making in evaluating digital retrofitting solutions: utilizing AHP and TOPSIS (Alqoud et al., 2025)	Digital transformation, AHP, TOPSIS, Industry 4.0, digital transformation	Helping manufacturers choose the best digital transformation strategy based on multiple criteria will increase the effectiveness of the transition to Industry 4.0 era.	Complexity in weighting conflicting criteria and reliance on the subjective preferences of industry practitioners.	The AHP-TOPSIS method identifies IoT hardware-based solutions as the most effective digital transformation approach to improve manufacturing competitiveness in the industry 4.0 era.
37	DecideXpert: Collaborative system using AHP-TOPSIS and fuzzy techniques for multicriteria group decision-making (Saoud et al., 2025)	MCDA, AHP, TOPSIS, DSS	Facilitates AHP and TOPSIS-based decision-making with fuzzy logic integration, improves accuracy under conditions of uncertainty, and supports multi-stakeholder collaboration.	Reliance on user expertise in determining criteria weights and possible bias in subjective evaluation processes.	The decideXpert platform offers flexible, intuitive, and collaborative AHP and TOPSIS-based MCDA solutions, enhancing decision-making effectiveness in various domains.
38	Natural fibre composite selection for two-stroke marine engine under piston door using hybrid AHP and TOPSIS methods (Yiow et al., 2025)	AHP TOPSIS NFC Biopolymer Natural fibre	It allows for systematic and objective evaluation of various material alternatives based on technical and economic criteria.	The method is subject to subjectivity in the weighting of the criteria and potential bias in pairwise comparisons.	The AHP-TOPSIS method identified hemp as the best natural fiber (score 0.870) and poly(lactic acid) as the best biopolymer (score 0.801) for marine engine piston sub-door applications.
39	Cobot selection using hybrid AHP-TOPSIS-based multi-criteria decision-making technique for fuel filter assembly process (C & Subramaniam, 2024)	Collaborative robot, Assembly task MCDM, AHP, TOPSIS	Enables systematic selection of a cobot based on predetermined criteria weights, improving cost	Limitations in handling dynamic changes in the production environment and potential	The AHP-TOPSIS approach successfully identified the best cobot from 12 diesel fuel

No	Title	Variables	Benefits of DSS in Decision-making	Advantages of DSS Method	Results
			and energy efficiency.	bias in determining criteria weights.	filter assembly alternatives, improving operational efficiency and cost savings.
40	Evaluating risk factors in automotive supply chains: A hybrid fuzzy AHP-TOPSIS approach with extended PESTLE framework (I. Gupta et al., 2025)	Supply chain risk, AHP, TOPSIS, Hybrid method PESTLE	Enables identification and prioritization of the most impactful risk factors and the development of data-driven mitigation strategies.	Complexity in determining risk weights and reliance on the subjective judgment of professionals.	The FAHP-FTOPSIS approach successfully identified 34 key ERFs affecting automotive supply chain KPIs, extending the PESTLE model with Transportation and Material factors to improve operational resilience.

An integrated AHP and TOPSIS approach is used to weigh the extinction coefficient, while the TOPSIS method determines the final ranking of the observed alternatives (Ogonowski, 2022). TOPSIS and AHP are familiar and easy to implement; AHP helps describe complex problems, while TOPSIS provides clear ranking solutions. The design of the Analytical Hierarchy Process (AHP) and TOPSIS rules uses a qualitative scale to a quantitative scale so that the selected provisions can be more objective. The combination of AHP and TOPSIS offers a strong methodological approach, combining the advantages of both methods to produce more reliable and valid decisions to be used in the decision-making process with the established criteria.

The results of the analysis of several selected articles strengthen the statement that the combination of the Analytic Hierarchy Process (AHP) and Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) methods provides a more systematic and accurate approach in the decision-making process with multiple criteria. Through AHP, the relative weights of the various existing criteria can be determined based on pairwise comparisons. At the same time, TOPSIS helps to rank various alternatives while still considering ideal and anti-ideal solutions. The combination of AHP-TOPSIS will support the achievement of superior and optimal decisions while still considering objective and subjective aspects simultaneously, compared to applying a single method.

In the decision-making process, using a combination of AHP-TOPSIS has advantages over a single method, because it can overcome the limitations of each method individually. The AHP method is quite effective in determining the weight of criteria based on the decision hierarchy. Still, it has limitations when applied to a larger and more complex system. On the other hand, TOPSIS is very effective in evaluating various options by considering the ideal solution but is less effective in overcoming various subjective uncertainties related to criteria weighting. By combining AHP and TOPSIS in integrating the weight of criteria and ranking of alternatives, the decisions will be accurate and precise, because there is a balance between structural analysis and proximity-based evaluation of the optimal solution.

The combination of AHP-TOPSIS methods is more flexible when applied to the decision-making process in various fields, such as engineering, manufacturing industry, and supply chain management. This combination makes decisions more transparent, allowing stakeholders to understand the multiple reasons and considerations underlying the decision-making. With these advantages, the combination of AHP-TOPSIS methods can provide more adaptive solutions to the dynamics of environmental change and industrial needs, so it can increasingly face challenges in the industrial era 4.0.

The increasingly complex business environment of decision-making often faces the challenge of cognitive biases, one of which is groupthink, where social pressure drives consensus without critical evaluation of available alternatives. To overcome this, a decision support system (DSS) based on the Analytic Hierarchy

Process (AHP) method and the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) offers a more objective data-based approach. The results of the study can answer the following research questions:

1. How can the AHP-TOPSIS method be integrated into a decision-support system to reduce groupthink bias in group decision-making?

The AHP-TOPSIS method can be integrated into a decision support system (DSS) to reduce groupthink bias by providing an objective and data-driven framework in the group decision-making process. AHP allows for systematic weighting of criteria based on pairwise comparisons, which reduces the dominance of a particular individual's opinion in the group. On the other hand, TOPSIS helps mathematically rank various alternatives offered, considering ideal and non-ideal conditions, so that it can reduce the tendency of groups to choose specific options due to the influence of social pressure or unimportant agreements. Optimizing the process analysis in DSS by integrating AHP-TOPSIS can better guarantee that decisions are made based on transparent and accountable evaluation results, not intuition or majority opinion.

2. What factors influence the success of AHP-TOPSIS-based DSS implementation in reducing groupthink in organizations or companies?

Several main factors influence the success of AHP-TOPSIS-based DSS implementation in reducing groupthink. First is data quality and clarity of decision criteria, because the system requires valid and relevant input to produce accurate analysis. Second, the diversity of stakeholder backgrounds involved in the decision-making process and active engagement with various perspectives can reduce the dominance of certain groups, thereby increasing the validity of the results. Third, system integration that can provide transparent and accountable analysis so that it can be audited, allowing users to trace the basis of decisions and avoid subjective bias. Fourth, the level of adoption and ease of use of the DSS, because an intuitive and easy-to-use system will increase acceptance among decision-makers. Finally, support from management and an organizational culture that supports data-based decision-making ensures that the AHP-TOPSIS-based DSS is used optimally in strategic decision-making.

Based on the review's results, it is evident that integrating the AHP and TOPSIS methods contributes to objectivity and transparency in decision-making, sharpening mitigation and overcoming cognitive bias, which can improve the quality of decisions made within a company. The combined application of AHP and TOPSIS can strengthen an anti-bias framework. AHP minimizes the influence of individual or group dominance on a transparent weighting system, while TOPSIS ensures that alternative decisions are based on a mathematical approach. The application of these two methods provides a balance between structural weighting and alternative ranking. Thus, a quantitative analytical approach can be used to expand the literature on decision bias as an effort to control cognitive bias.

A literature review of 40 scientific articles reveals that the use of DSS based on the AHP-TOPSIS method has been applied in various fields, including healthcare, supply chain management, education, and digital transformation. The study found that AHP-TOPSIS is most widely used in supplier selection, resource allocation, and the evaluation of sustainability strategies. The application of these two methods makes a significant contribution as a cross-disciplinary bridge between the organizational psychology literature, which discusses cognitive biases, and the decision analysis literature, which focuses on multi-criteria decision-making. A comparative analysis with other methods, such as Fuzzy-AHP, ANP, or DEA, demonstrates the superiority of AHP-TOPSIS in terms of transparency, accountability, and ease of implementation. This hybrid method is relatively easier to understand for non-technical decision-makers while producing auditable decisions through weighted and ranking trails. This advantage is particularly relevant for organizations with collaborative and participatory decision-making processes, where the risk of groupthink is higher.

The findings of this study also open new directions for further research. Empirical evaluation in a real-world organizational context is needed to test the effectiveness of AHP-TOPSIS in suppressing groupthink. Integration with digital technology and artificial intelligence (AI) has the potential to create an adaptive, automated, and large-scale data-processing system that reduces bias. Cross-cultural studies are also crucial for understanding the differences in group behavior that influence the decision-making process. Thus, an AHP-TOPSIS-based DSS not only makes a practical contribution to improving decision quality but also a theoretical contribution to the development of an anti-bias framework in modern strategic management.

CONCLUSION

Integrating the AHP-TOPSIS method in a decision support system (DSS) has been proven to reduce groupthink bias in group decision-making by providing systematic, objective, and data-based analysis. AHP helps to assign criteria weights fairly, while TOPSIS allows ranking alternatives based on ideal solutions so that decisions do not depend only on group consensus. With better transparency and traceability of analysis, AHP-TOPSIS-based DSS can improve accuracy and accountability in decision-making.

The success of implementing an AHP-TOPSIS-based DSS depends on data quality, stakeholder diversity, system transparency, and the adoption of easy-to-use technology. Management support and a data-based organizational culture are key factors in implementing this system effectively. Therefore, the development and optimization of AHP-TOPSIS-based DSS must continue to increase organizational resilience to decision bias and strengthen the quality of business strategies in a complex environment.

LIMITATION

This study presents a systematic literature review (SLR) on integrating the AHP-TOPSIS method into a decision support system (DSS) to mitigate groupthink bias in group decision-making. However, several limitations need to be considered. First, the scope of this study is limited to peer-reviewed journal articles published in English, so there may be relevant research in other languages that are not accommodated. Second, this study is conceptual and has not empirically tested the effectiveness of AHP-TOPSIS integration in a real organizational context. Further research is recommended to conduct empirical or experimental studies to test the benefits of AHP-TOPSIS integration in reducing groupthink in various types of organizations and decision-making environments. In addition, exploring other combinations of multi-criteria decision-making methods and integrating digital technology or artificial intelligence (AI) in DSS can enrich the findings and practices in the field. Future research should also consider the impact of the organization's cultural, psychological, and structural factors on the success of implementing AHP-TOPSIS-based DSS in mitigating cognitive biases, such as groupthink.

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