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COMPARISON OF FUZZY LOGIC IMPLEMENTATION AND SAW IN DECISION SUPPORT SYSTEM STRATEGIC FUNCTION AND INNOVATION: A SYSTEMATIC LITERATURE STUDY

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ABSTRACT. The study compares the implementation of Fuzzy Logic and Simple Additive Weighting (SAW) in Decision Support System (DSS) strategic and innovation functions through a systematic literature study. Fuzzy Logic and SAW are two techniques that are often used in DSS to support complex and multi criteria decision making. However, there is a need to understand the advantages and limitations of each method in the context of DSS, especially in terms of accuracy, flexibility, and the ability to handle uncertainty. The main focus of this study is to analyze the strategic and innovation functions produced by both methods. The purpose of this study is to provide in-depth insight into the conditions and situations where one method is superior to the other, as well as to provide recommendations for the development of a more effective and innovative DSS. This literature study collects and evaluates various studies that discuss the application of Fuzzy Logic and SAW in the context of DSS. A systematic approach is used to identify, select, and analyze relevant literature, to ensure that the findings are based on strong and reliable evidence. The results show that Fuzzy Logic and SAW have their respective advantages and limitations in terms of accuracy, flexibility, and the ability to handle uncertainty. This research provides recommendations for the development of more effective and innovative DSS.

Keywords: Decision Support System, Fuzzy Logic, Innovation, Simple Additive Weighting, Strategic Function

1. INTRODUCTION

The development of information and communication technology has driven the increasing need for more sophisticated and effective decision support systems. DSS is a system designed to assist decision makers in complex and high-risk decision-making processes. DSS assists decision makers by providing relevant information, facilitating data analysis, and offering alternative solutions.In this context, two frequently used methods are Fuzzy Logic and Simple Additive Weighting (SAW).

Fuzzy Logic offers a more flexible approach to decision making due to its ability to handle uncertainty and uncertain data. On the other hand, SAW with its simpler and more intuitive approach allows for easier assessment and aggregation of criteria values. However, the implementation of Fuzzy Logic and SAW in DSS has its own advantages and limitations. Fuzzy Logic is known to be able to handle situations with uncertain data and provide more realistic results in complex conditions. Meanwhile, SAW is known for its simplicity in calculation and its ability to provide fast and easy-to-understand solutions. Although Fuzzy Logic and SAW have their own advantages, both also have limitations. Fuzzy Logic is able to handle situations with uncertain data and provide more realistic results in complex conditions. However, this method can be more complicated in its implementation. On the other hand, SAW is known for its simplicity in calculation and its ability to provide fast and easy-to-understand solutions. However, this method may be less effective in dealing with uncertain data and very complex situations.

By understanding the strengths and weaknesses of both methods, researchers and practitioners can choose the most appropriate method for their specific needs, thereby increasing the overall effectiveness of the DSS. Therefore, the comparison between Fuzzy Logic and SAW becomes a relevant and important topic to be studied. This study aims to conduct a systematic literature study comparing the implementation of Fuzzy Logic and SAW in DSS, especially in the context of strategic and innovation functions. This study collects and analyzes various relevant literature sources to identify the benefits and challenges associated with the use of both methods.

This research is expected to provide more comprehensive insights into the practical application of Fuzzy Logic and SAW in DSS. In addition, this research can provide recommendations that help practitioners and researchers in choosing the most appropriate method for their specific needs, so as to increase the effectiveness and innovation in the development of DSS in the future. Through a better understanding of the advantages and limitations of these two methods, it is expected that the resulting DSS can be more effective in supporting complex and high-risk decision making, and be able to adapt to various conditions and situations faced.

2. Theoritical Review

1. Fuzzy Logic

Fuzzy Logic first introduced by [1] as a form of multivalent logic that handles uncertainty and confusion in data. Unlike binary logic that only recognizes two values (0 and 1), Fuzzy Logic is able to handle values between 0 and 1, which represent the degree of membership in a fuzzy set. This makes Fuzzy Logic very useful in various applications that involve uncertain and complex decisions. The basic principle of Fuzzy Logic is the use of membership functions to determine the degree of membership of an element in a fuzzy set. This membership function is usually expressed in the form of a curve that connects input values with the degree of membership (values between 0 and 1). The decision making process using Fuzzy Logic involves three main steps: fuzzification, fuzzy inference, and defuzzification. In the fuzzification stage, crisp (precise) input is converted into fuzzy values using membership functions. Then, fuzzy inference is carried out to obtain conclusions based on the fuzzy rules that have been set. Finally, in the defuzzification stage, the fuzzy results are converted back into crisp values to obtain interpretable output.

Fuzzy Logic has been widely applied in various decision support systems because of its ability to handle uncertainty and provide more realistic solutions in complex conditions. One example of its application is in the field of risk management, where Fuzzy Logic is used to evaluate the level of risk based on various uncertain and interrelated criteria. In addition, in the medical field, Fuzzy Logic is used to help diagnose diseases by considering various symptoms and test results that may be uncertain. [2] offers a flexible and effective approach to decision making under uncertain and complex conditions. Through the use of membership functions and fuzzy rules, Fuzzy Logic is able to provide more realistic solutions and can be applied in various fields.

2. Simple Additive Weighting (SAW)

Simple Additive Weighting is a method used in multicriteria decision making to evaluate and select the best alternative from a number of alternatives based on several predetermined criteria. This method involves determining the weight for each criterion, measuring the performance of each alternative against that criterion, and then summing the results of the multiplication of the criteria values and their weights to obtain the final score for each alternative.

SAW has been widely applied in various Decision Support System (DSS) applications due to its simplicity and ability to provide fast and easy-to-understand results. An example of SAW application can be found in supplier selection, where various factors such as price, product quality, and delivery reliability are evaluated to determine the best supplier. In the context of the COVID-19 pandemic, SAW is used to support more adaptive and responsive decision-making to changing market and operational conditions [3]

3. Decision Support System

Decision Support System (DSS) is a computer based system used to support the decision-making process in organizations. DSS integrates data, analytical models, and tools to support decision makers in solving semi-structured and unstructured problems. DSS is designed to improve the effectiveness of decision making by providing relevant information, analytical tools, and modeling capabilities. According to [4] DSS assist in decision making by providing interactive, flexible, and adaptive support that can be accessed and used by managers and decision makers in a variety of situations.

By integrating data, analytical models, and intuitive user interfaces, DSS help decision makers analyze information, evaluate alternatives, and make more informed decisions. The use of DSS in applications such as supplier selection and project risk management demonstrates the flexibility and significant benefits of these systems in improving the effectiveness and efficiency of decision making.

4. Strategic Function

Strategic functions refer to the activities and roles that strategy plays in an organization to achieve long-term goals and maintain competitive advantage. Strategic functions include the formulation, implementation, and evaluation of

strategies designed to address internal and external environmental challenges and to capitalize on opportunities. Research by [5] demonstrates how strategic functions can be applied in technology companies to maintain competitive advantage. Grant emphasizes the importance of continuous environmental analysis and adjusting strategy based on market and technology changes to remain relevant and competitive.

The strategic function plays a vital role in determining the long-term direction and success of an organization. With proper strategy formulation, implementation, and evaluation, an organization can achieve its goals, adapt to change, and maintain a competitive advantage. The strategic function enables an organization to use resources effectively and respond to the dynamics of the business environment. [6]

5. Innovation

Innovation as the development or use of new ideas, products, or processes that introduce significant changes in the way of thinking or doing things. Innovation can occur in a variety of contexts, including technological, business, organizational, or social, and is key to creating new value and meeting evolving market needs. The innovation process involves a series of steps to generate ideas, develop concepts, and implement them into successful products or services. [7]

Research by [8] which illustrates the importance of open innovation in the modern technology industry. The concept of open innovation emphasizes the importance of collaboration between companies, universities, and individuals in generating new ideas and integrating innovations from outside the organization to create innovative products or services. Innovation is a key factor in creating new value, increasing competitiveness, and overcoming challenges in various areas of life. By adopting a systematic and creative approach in developing ideas and implementing them, organizations and individuals can harness the potential of innovation to achieve long-term success.

3. METHOD

Systematic Literature Review (SLR) is a systematic and methodological research method for investigating, evaluating, and synthesizing literature relevant to a particular research topic or research question. This approach is used to obtain a comprehensive overview of the existing knowledge in a field and to identify key findings. The SLR method creates a transparent, systematic, and objective approach to detailing the understanding of the literature on a research topic. It provides a solid foundation for decision making, policy development, and knowledge development across disciplines. [9] a renowned researcher and methodologist in the field of software engineering, has made significant contributions to the development and understanding of Systematic Literature Reviews (SLRs). Kitchenham has played a key role in developing guidelines and methods for conducting SLRs in the context of computer science and software engineering. To ensure transparency, replicability, and accountability in the literature selection process, this study refers to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework. This approach was developed as a guideline for systematic reporting in literature reviews. The initial step begins with collecting all articles from various databases, then removing duplicates to avoid double-counting. The initial screening process is carried out on titles and abstracts to select relevant articles. Articles that meet the initial criteria are then searched for their full text versions and further analyzed to assess eligibility based on the inclusion and exclusion criteria that have been set. Literature that does not meet the criteria, for example published outside the 2020–2024 period or comes from journals with low reputations, is excluded from the final analysis. This process aims to maintain the academic quality of the sources analyzed. The following is the PRISMA framework for writing this article:

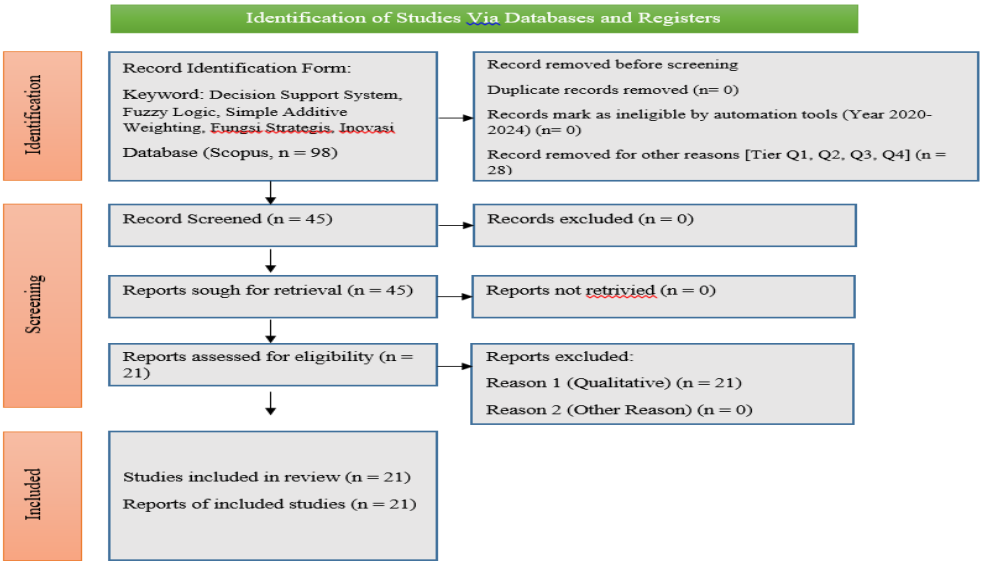

Figure 1. PRISMA Framework

This study conducted a literature search through Scopus, Google Scholar and Publish or Perish databases using the keywords: Decision Support System, Fuzzy Logic, Simple Additive Weighting, Strategic Function, and Innovation, which resulted in 98 articles. A total of 28 articles were removed because they came from journals with a certain Tier ranking that did not meet the criteria, leaving 45 articles to be screened. All 45 articles were selected at the screening and retrieval stage without any being removed. Of these, 21 articles met the eligibility criteria and were declared worthy of further review. No reports failed to be retrieved or excluded for other reasons. Finally, 21 studies were included in the systematic review, with the number of reports analyzed also being 21. Of these 21 articles, there are 12 articles from 2020, 3 articles from 2021, 3 articles from 2022, 2 articles from 2023, and 1 article from 2024 as seen in graph 2.

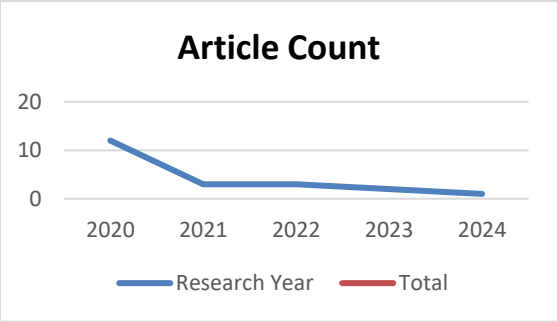

Figure 2. Publication Trends 2020-2024

Despite the declining publication trend, this topic remains relevant and worthy of further research because the decline in publications does not mean a decline in the urgency or need for decision support system development, especially in increasingly complex contexts such as logistics management, strategic planning, and data-driven decision making. Fuzzy Logic and Simple Additive Weighting methods have great potential to be adapted to new contexts and current challenges, such as digitalization and automation of business processes. And there is still room for innovation and integration of these methods with new technologies. Thus, despite the declining publication trend, this topic still has potential contributions to the development of managerial knowledge and practice, especially in more applicable strategic and innovative contexts.

4. RESULT AND DISCUSSION

After conducting a comprehensive literature study, this study has collected various relevant data and findings regarding the implementation of Fuzzy Logic and Simple Additive Weighting in Decision Support Systems. This section will present the results of the analysis of these findings, which include a comparison of the advantages and limitations of both methods in various application contexts. This discussion will provide a clearer picture of the effectiveness of each method and provide in-depth insight into the conditions and situations where one method may be superior to the other. The following is a table listing literature reviews of several articles that the author has obtained from the search:

Table 1. Results of Systematic Literature Review

No	Research Title, Author Name & Year	DSS Methods Used	Strategic Function	Innovation	Uniqueness/Novelty	Conclusion
1	Fuzzy Logic Based Decision Support Systems for	Fuzzy Logic Method	Improve reliability across healthcare settings and conditions. Facilitate collaborative development by opening up the system	The integration of fuzzy logic principles in decision support systems for medical diagnosis offers	Development of an open-source version of a fuzzy logic-based decision support system. And marks a	Research shows that fuzzy logic-based decision support systems developed for surgery can be extended

No	Research Title, Author Name & Year	DSS Methods Used	Strategic Function	Innovation	Uniqueness/Novelty	Conclusion
	Medical Diagnosis(Basvant et al., 2024)		code base. Promote transparency, replication, and customization in the medical environment.	innovative contributions by improving reliability, interpretation, applicability, and ethical compliance in healthcare settings.	significant advancement in medical diagnosis through the application of fuzzy logic-based decision support systems.	to other medical specialties.
2	Application of SAW Method in Decision Support System for Determination of Exemplary Students(Amalia & Alita, 2023)	SAW Method	Providing solutions to existing problems so that the assessment of exemplary students becomes more effective and efficient in terms of time and selection.	This system helps teachers in making more appropriate decisions, resulting in a more effective and efficient exemplary student selection process.	More detailed and accurate decision-making in determining exemplary students, ensures that prospective exemplary students are selected who truly meet the established criteria.	Assist in detailed and accurate decision making, using predetermined weights, to select prospective students who are truly exemplary and meet the established criteria. Thus producing a more effective and efficient exemplary student selection process.
3	Decision Support System For The Selection Of New Prospective Students Using The Simple Additive Weighted (SAW) Method(Kelen et al., 2023)	SAW Method	Institutions can ensure that students accepted are qualified to meet the desired standards. A more efficient selection process can reduce administrative and operational burdens, freeing staff and management to focus on other strategic tasks.	Demonstrates how technology and mathematical methods can be integrated into the educational admissions process, creating more modern and effective solutions.	The use of the innovative, multi-criteria SAW method in the student admission selection process offers a more objective, faster, and more accurate approach compared to traditional methods.	Showing that candidate V1 gets the highest weight, indicating that the SAW method can be used to identify the best candidates precisely. So that it can be implemented in the selection process for new student admissions in educational institutions, and provide a convergent solution and facilitate in determining admission decisions based on the highest weight.
4	Applications of Modified Simple Additive Weighting Method in Manufacturing Environment(Biswas & Chaki, 2022)	SAW Method	Modified Simple Additive Weighting (SAW) method for decision making in complex engineering problems involving robot selection, Flexible Manufacturing Systems (FMS), and Non-Traditional Machining (NTM) processes.	Development of a modified SAW method for MCDM applications in manufacturing. Evaluation of the modified SAW method through three different modern manufacturing problems: industrial robot selection, FMS process, and NTM.	A comparative study between the modified SAW method and other popular MCDM methods such as MABAC, AHP, TOPSIS, COPRAS, ELECTRE, PROMETHEE, shows that this method has advantages in computation time, simplicity, stability, and robustness.	Cybotech V15 electric robot is considered as the best alternative for various purposes including welding, drilling, assembly and other operations. MS7 is selected as the best alternative with significant reduction in labor cost, work process and setup cost and improvement in quality and market response, while capital and maintenance cost remain low. Ultrasonic Machining is determined as the best alternative useful for providing high precision parts from hard

No	Research Title, Author Name & Year	DSS Methods Used	Strategic Function	Innovation	Uniqueness/Novelty	Conclusion
						and brittle materials that are difficult to machine.
5	Development of Decision Support System Application for Admission of New Students and Determination of Major Using Simple Additive Weighting (SAW)(Ramadaniah et al., 2022)	SAW Method	Provides a structured approach to decision making, increasing efficiency, accuracy and automation in selecting alternatives based on predetermined criteria.	This innovative system improves the decision-making process, reduces manual errors, and increases data security in the student admission process.	Implementation of the SAW method to improve the efficiency and accuracy of prospective student selection based on predetermined criteria. By automating the selection process, this system helps educational institutions make the right decisions and ensure fair admissions.	Decision Support System with SAW method is used to provide recommendations to students in choosing a major. The calculation result of this system is a ranking based on the values of Mathematics report, English report, Natural Science, Social Science, interest in Natural Science, interest in Social Science, parental advice for Social Science, and parental advice for Natural Science.
6	Assessing Normalization Techniques for Simple Additive Weighting Method(Vafaei et al., 2021)	SAW Method	The SAW method plays an important role in improving decision support systems by facilitating the evaluation and selection of appropriate normalization techniques in MCDM applications.	Recent innovations in the application of SAW methods to Decision Support Systems focus on improving the accuracy and reliability of the final ranking in MCDM problems.	This study strengthens the understanding of the importance of the role of normalization techniques in minimizing errors and provides new insights in the context of selecting postgraduate scholarship candidates using the SAW method.	This study uses various metrics from the proposed assessment framework to recommend the best technique among the six selected normalization techniques (Vector, Max, Max-Min, Sum, Logarithmic, and Enhanced accuracy) using the SAW method for a case study taken from the references.
7	Multi-Criteria Handover Management Using Entropy-Based SAW Method For SDN-Based 5G Small	SAW Method	The application of the SAW algorithm method with entropy weighting, in the decision-making process of handover management in SDN-based 5G small cell networks shows the importance of strategies in optimizing	The latest innovation in this research involves the utilization of the SAW algorithm with an entropy weighting approach for handover management in SDN-	This research presents a unique approach to address the handover management challenges in SDN-based 5G small cell networks by introducing efficient algorithms and	The centralized SDN controller performs all decisions by ensuring abstraction of the control and data planes. Nodes (mobile nodes and eNBs) in the data plane have been transformed into simple switching devices and only

No	Research Title, Author Name & Year	DSS Methods Used	Strategic Function	Innovation	Uniqueness/Novelty	Conclusion
	Cells(Cicioglu, 2021)		network performance and resource allocation.	based 5G small cell networks.	considering future advances in artificial intelligence and machine learning.	process flow rules in the flow table. Based on the simulation results, the proposed approach achieves 15%, 48%, and 22% improvement in handover delay, blocking probability, and throughput, respectively.
8	Decision Support System For Student Scholarship Recipients Using Simple Additive Weighting Method with Sensitivity Analysis(Khasanah et al., 2020)	SAW Method	Provides a systematic and objective method for ranking and selecting the best alternatives among scholarship candidates. So that it can simplify the decision-making process by normalizing the decision matrix, making it easier to compare alternative values and determine the best candidate based on various criteria.	It lies in its combination with the Weighted Product (WP) method and sensitivity analysis. This combination enhances the decision support system by providing a powerful mechanism for comparing and validating the sensitivity of various decision-making methods.	The integration of sensitivity analysis with SAW and WP methods. This integration is new because it offers an additional layer of validation in the decision-making process, ensuring higher accuracy and reliability.	The results of the study show that the SAW method is not only simple and fast but also effective in providing accurate and objective recommendations.
9	Development of Poverty Index for Districts in Kedah by Using CRITIC and Simple Additive Weighting Methods(Mohamad et al., 2021)	SAW Method	In compiling the poverty index in Kedah involves determining the weight of poverty indicators using the CRITIC approach and then applying the SAW method to calculate the poverty index in various districts in Kedah.	Adaptation of the SAW method to develop a Poverty Index for Districts in Kedah, enhancing the capability of the Decision Support System in analyzing and addressing poverty issues.	Integration of CRITIC and SAW methods to develop a customized Poverty Index for districts in Kedah. This study offers a new approach to address poverty measurement and analysis.	This study applies the CRITIC weighting method to determine the weight of poverty indicators in districts in Kedah. The results show that household size has the highest weight, which means this factor is the most important indicator that contributes to the poverty rate in Kedah.
10	A Fuzzy Logic Expert System to Predict Module Fault Proneness Using Unlabeled Data(Abaei et al., 2020)	Fuzzy Logic Method	Improving the capability of Decision Support System for error prediction in software engineering. This study demonstrates the effectiveness of fuzzy logic in optimizing the rule base and expert system database to improve prediction accuracy.	Providing more accurate fault prediction models. This advancement can reduce the reliance on expert knowledge and historical data, making the fault prediction process more robust and efficient.	Applying the proposed model to a new similar dataset to minimize potential issues. FPR, FNR, and overall error rate are used as evaluation metrics to compare the results with previous studies.	This study shows that a software error prediction approach can assist software developers in software quality and testing practices, especially when projects experience delivery delays.

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11	Identifying Optimal Sites for a Rainwater-Harvesting Agricultural Scheme in Iran Using the Best-Worst Method and Fuzzy Logic in a GIS-Based Decision Support System(Aghalooo & Chiu, 2020)	Fuzzy Logic Method	Sensitivity analysis, such as the OAT method, performed on the BWM + Fuzzy method shows the stability of the model and the sensitivity of the criteria, which are important for understanding the behavior of the modeled system. This study explores a stepwise strategy for shifting from traditional methods to RWH-based farming 20.	This study evaluated three types of RWH systems – pans and ponds, percolation tanks, and dams – to produce suitability maps for site selection on 20 RWH farms.	The researchers integrated hydraulic models into a geographic information system (GIS) to determine the best locations for RWH farming, taking into account spatial complexity.	Sensitivity analysis shows that the proposed new DSS is more stable and reliable compared to traditional methods which mostly use AHP and WOP in GIS for site selection.
12	Decision Support System For Diagnosing Rheumatic-Musculoskeletal Disease Using Fuzzy Cognitive Map Technique(Akinnuwesi et al., 2020)	Fuzzy Logic Method	The early diagnosis model of systemic lupus erythematosus achieved 83% accuracy using generalized regression neural network (GRNN) with dsDNA antibodies as training patterns. The Backpropagation neural network model for early diagnosis of Kawasaki disease showed impressive accuracy.	Developing and implementing RMD-FCMDSS, an artificial intelligence tool for rheumatologists and physicians.	Presenting a new approach to diagnosing Rheumatic Musculoskeletal Diseases by creating a multi-symptom and multi-disease analysis matrix with an algorithm that reflects the physician's decision-making process.	The developed RMD-FCMDSS is an artificial intelligence tool for rheumatologists and physicians, which considers causal interactions between symptoms and integrates risk factors in the decision-making process. A positive relationship was found between each symptom concept and RMD in the weight matrix.
13	A Choquet Integral Based Fuzzy Logic Approach To Solve Uncertain Multi-Criteria Decision Making Problems(Chen et al., 2020)	Fuzzy Logic Method	The ability to handle uncertainty effectively, especially in scenarios where traditional Boolean logic fails. The integration of fuzzy logic enables a deeper understanding of uncertain data and expert judgment, resulting in a more informed decision-making process.	The innovative Choquet integral-based fuzzy logic approach presented in this study provides a promising solution to handle uncertainty in the decision-making process in Decision Support Systems.	The evaluation method uses triangular fuzzy numbers to describe the assessment and importance of attributes in decision making. This study provides a comprehensive view of the final strategy of refrigerator components.	The study uses Choquet integral to evaluate and select the optimal scheme based on comprehensive evaluation values. The evaluation values of the primary criteria are presented with weights (g λ) for various alternatives (choices). Linguistic evaluation and the importance of attributes are expressed using triangular fuzzy numbers. This approach can effectively overcome the correlation between decision attributes.

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14	Clinical Decision Support System to Predict Chronic Kidney Disease: A Fuzzy Expert System Approach (Hamedan et al., 2020)	Fuzzy Logic Method	Fuzzy logic in this study is used in designing and implementing a medical decision support system to predict disease progression, such as chronic kidney disease.	The inclusion of important factors such as GFR improves the diagnostic performance of the system. Fuzzy expert systems ensure that the rules and variables are defined and understood by domain experts, thereby encouraging the acceptance of the system in real practice.	Developing a FES approach for early prediction of CKD, demonstrating success in dealing with noisy data. Fuzzy expert systems highlight the advantages of rule clarity and easy-to-understand interpretation by general practitioners.	This study developed a Fuzzy Expert System (FES) for early prediction of Chronic Kidney Disease (CKD). This study highlights the need for early prediction and rapid intervention for CKD, with the accuracy, sensitivity, and specificity of the system reaching 92.13%, 95.37%, and 88.88%.
15	SAW Method in Supporting the Process of Admission of New Junior High School Students(Hamidah et. al. 2020)	SAW Method	It lies in its ability to guide managers and practitioners towards an effective decision-making process. By providing a structured approach to evaluating alternatives, the SAW method contributes to improving the functionality of decision support systems.	Innovating in facilitating the decision-making process for accepting new students, so that schools can select students quickly, accurately, and fairly.	Emphasizing on fairness, precision, and efficiency that distinguishes it from traditional methods, this study presents a modern and innovative approach in the student selection process in educational institutions.	The SAW method is used to find the ranking results from the highest to the lowest scores so that this method can be used as a solution that is very helpful for schools in the process of accepting new students.
16	Application of Fuzzy Logic for Honey Bee Colony State Detection Based on Temperature Data(Kviesis et al., 2020)	Fuzzy Logic Method	Detecting changes in bee behavior for early detection of abnormalities, especially to predict colony collapse. The proposed DSS prototype concept for honey bee colony management integrates fuzzy logic as a knowledge processing unit, emphasizing data, models, and knowledge in the decision-making process.	The proposed DSS for honeybee colony management integrates fuzzy logic for knowledge processing. The prototype DSS concept is based on data, models, and knowledge, focusing on automatic honeybee state detection through innovative use of temperature data.	The monitoring system uses temperature sensors in and near the hive to continuously measure temperature changes, helping to identify varying conditions of the bee colony.	The system achieved high accuracy, precision, recall, and F1 score values when tested. Fuzzy logic can estimate complex nonlinear functions with simple models, so it can be applied to recognize the state of honey bee colonies based on temperature changes. The nonlinear behavior of honey bee colonies is in line with the ability of fuzzy logic to detect conditions.
17	A Fuzzy Logic Expert System For Selecting Optimal and Sustainable Life Cycle Maintenance and Rehabilitation	Fuzzy Logic Method	FLS helps in selecting a single solution from a set of optimal solutions obtained from multiobjective optimization, enhancing the capacity of decision makers to make strategic and informed decisions.	Its innovation lies in the ability of Fuzzy Logic Systems to effectively handle imprecise, uncertain and qualitative data in decision support systems, thereby improving the	Integrating specific data and parameters from a French road case to develop an optimal M&R strategy. Applying real case analysis to achieve the best	The proposed methodology for selecting a single solution from a Pareto optimal set in a sustainable road maintenance and repair (M&R) strategy has shown that improvements in environmental metrics

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	Strategies For Road Pavements(Santos et al., 2020)			decision-making process.	strategy in flexible road management.	can be achieved compared to current M&R practices.
18	Decision Support System for Subsidized Housing Selection Based on Best-Worst Method and Simple Additive Weighting(Suhandi, 2020)	SAW Method	The ability to improve the effectiveness of decision support systems by facilitating structured evaluation of criteria and alternatives for selecting subsidized housing options.	Providing the best alternative recommendations based on predetermined criteria. This innovation is expected to simplify the process of selecting subsidized housing and increase public satisfaction.	Presents a new approach to decision-making in subsidized housing selection, which meets the needs of low-income communities by integrating sophisticated decision-making methods.	Shows that BWM and SAW can be used as a decision support system in the selection of subsidized housing to help underprivileged people who are generally less informed in making practical decisions.
19	Major Choosing Decision Support System With Talent Interest Approach Using SWRL And SAW Method. SIET '20(Wardani et al., 2020)	SAW Method	Facilitates the weighting of various criteria in the decision-making process by allowing users to assign subjective preferences to different factors.	Improved decision-making process by combining talent interest approach and considering multiple criteria for department selection.	Combining the use of Simple Additive Weighting method for criteria weighting and Semantic Web Rule Language (SWRL) for final decision making, provides a comprehensive decision support framework.	This study evaluates the system by comparing its results with respondents' approval ratings. The results show that the alternatives generated by the system can be implemented in the decision-making process in the selected departments.
20	Fuzzy Logic Based Dynamic Decision-Making System For Intelligent Navigation Strategy Within Inland Traffic Separation Scheme(Wu et al., 2020)	Fuzzy Logic Method	Facilitate the development of intelligent decision-making models that mimic human-like decision-making processes for navigation strategy selection.	Analyze the dynamic characteristics of navigation processes, including free navigation, ship following, and ship overtaking. The model can be implemented in a decision support system for safe navigation or autonomous navigation.	The proposed model can be implemented in a decision support system for safe navigation or incorporated into an autonomous navigation process. The model considers ship dynamic features such as ship speed, ship length, and traffic flow.	There is a new approach to intelligent navigation strategy selection based on human-like decision-making processes, particularly focused on inland TSS waters.
21	Decision Support System For Employee Bonus Determination	SAW Method	Assisting administrators in determining employee bonuses quickly and effectively. Designing and creating a system to determine which	The system in this study was tested using a method that focuses on functionality without looking into the code, ensuring	The system was tested using the black box method to identify and fix any errors. This study utilized the PHP programming	The development of a decision support system for determining employee bonuses using the Simple Additive Weighting (SAW) method. The

No	Research Title, Author Name & Year	DSS Methods Used	Strategic Function	Innovation	Uniqueness/Novelty	Conclusion
	With Web-based Simple Additive Weighting (SAW) Method In Pt. Mayatama Solusindo(Irawan, 2020)		employees are eligible for bonuses.	that the system works as expected from the user's perspective.	language for coding, which is known for its flexibility, security features, and ease of integration with other technologies.	appearance of the decision support system includes the Splash Screen Form, Login Form, and Dashboard Form.

In this study, the author compares two methods that are often used in decision support systems, namely Fuzzy Logic and Simple Additive Weighting. Both methods have their respective advantages in various applications, from medical to project management. The following is a comparative analysis based on various studies that have been conducted:

1. Fuzzy Logic Based Decision Support Systems for Medical Diagnosis

Fuzzy logic enables the integration of medical expertise in medical diagnosis, enriching the decision-making process and increasing the effectiveness of the system in various medical specialties. This shows the flexibility and ability of fuzzy logic in dealing with the uncertainty and complexity of medical data.

2. Application of SAW Method in Decision Support System for Determination of Exemplary Students

The SAW method provides an effective and efficient solution in assessing exemplary students. SAW allows detailed and accurate decision making using predetermined weights, thus assisting teachers in the student selection process.

3. Decision Support System For The Selection Of New Prospective Students Using The Simple Additive Weighted (SAW) Method

SAW is used to identify the best candidates in the student admission selection process, showing that this method can provide convergent solutions and facilitate admission decisions based on the highest weights.

4. Applications of Modified Simple Additive Weighting Method in Manufacturing Environment

SAW is used to select the best alternative in a manufacturing environment, reducing costs and improving quality. This method shows flexibility in a variety of industrial applications, from welding to high-precision operations.

5. Development of Decision Support System Application for Admission of New Students and Determination of Major Using Simple Additive Weighting (SAW)

SAW is used to provide recommendations to students in choosing majors based on academic grades and interests. This shows SAW's ability to process multi-criteria data to produce the right decisions.

6. Assessing Normalization Techniques for Simple Additive Weighting Method

This study shows that the Max-Min normalization technique is the best for the SAW method, ensuring consistent and optimal results in the case studies analyzed.

7. Multi-Criteria Handover Management Using Entropy-Based SAW Method For SDN-Based 5G Small Cells

SAW is used in handover management for 5G networks, improving network performance in terms of delay, blocking probability, and throughput, demonstrating the applications of SAW in a high-tech context.

8. Decision Support System For Student Scholarship Recipients Using Simple Additive Weighting Method with Sensitivity Analysis

SAW combined with WP method and sensitivity analysis to select scholarship recipients, shows that SAW can provide accurate and objective recommendations in the educational context.

9. Development of Poverty Index for Districts in Kedah by Using CRITIC and Simple Additive Weighting Methods

SAW was used together with the CRITIC method to develop a poverty index, showing that SAW can be used in socio-economic analysis by combining various indicators.

10. A Fuzzy Logic Expert System to Predict Module Fault Proneness Using Unlabeled Data

Fuzzy logic is used to predict software errors without historical data, demonstrating that fuzzy logic can handle uncertainty and lack of labeled data in technical decision making.

11. Identifying Optimal Sites for a Rainwater-Harvesting Agricultural Scheme in Iran Using the Best-Worst Method and Fuzzy Logic in a GIS-Based Decision Support System

Fuzzy logic is used for optimal location selection in rainwater harvesting based farming schemes, showing higher stability and reliability than traditional methods such as AHP and WOP.

12. Decision Support System For Diagnosing Rheumatic-Musculoskeletal Disease Using Fuzzy Cognitive Map Technique

Fuzzy logic is used to handle data uncertainty and symptom confusion in the diagnosis of rheumatic diseases, demonstrating the ability of fuzzy logic in the integration of risk factors and symptom interactions.

13. A Choquet Integral-Based Fuzzy Logic Approach To Solve Uncertain Multi-Criteria Decision-Making Problems

Fuzzy logic uses the Choquet integral to evaluate and select the optimal scheme, demonstrating the ability to handle correlations between decision attributes and provide comprehensive solutions.

14. Clinical Decision Support System to Predict Chronic Kidney Disease: A Fuzzy Expert System Approach

Fuzzy logic was used for early prediction of chronic kidney disease, showing high accuracy, sensitivity, and specificity in disease detection, highlighting the importance of early prediction and rapid intervention.

15. SAW Method in Supporting the Process of Admission of New Junior High School Students

SAW is used to rank students based on highest to lowest scores, assisting schools in the admission process with a structured and objective solution.

16. Application of Fuzzy Logic for Honey Bee Colony State Detection Based on Temperature Data

Fuzzy logic is used to detect the state of honey bee colonies based on temperature data, demonstrating the ability to recognize non-linear and complex behavior with simple models.

17. A Fuzzy Logic Expert System For Selecting Optimal and Sustainable Life Cycle Maintenance and Rehabilitation Strategies For Road Pavements

Fuzzy logic is used to select sustainable road maintenance strategies, showing improvements in environmental metrics compared to current practices, highlighting the importance of environmentally friendly solutions.

18. Decision Support System for Subsidized Housing Selection Based on Best-Worst Method and Simple Additive Weighting

SAW is used in conjunction with the Best-Worst method for subsidized housing selection, demonstrating its ability to help underprivileged people make practical decisions based on defined indicators.

19. Major Choosing Decision Support System With Talent Interest Approach Using SWRL And SAW Method

SAW is used in conjunction with SWRL to select majors based on talent interests, demonstrate applications in educational contexts and help students make decisions based on personal interests.

20. Fuzzy Logic Based Dynamic Decision-Making System For Intelligent Navigation Strategy Within Inland Traffic Separation Schemes

Fuzzy logic is used to select intelligent navigation strategies in inland TSS waters, demonstrating the capability of human-like decision-making processes and the challenges in broad application.

21. Decision Support System For Employee Bonus Determination With Web-based Simple Additive Weighting (SAW) Method In Pt. Mayatama Solusindo

SAW is used to determine employee bonuses, demonstrate applications in a corporate context and provide structured and objective solutions for management decision making.

Based on the results of 21 studies reviewed, it is seen that Fuzzy Logic and Simple Additive Weighting have significant roles in various Decision Support System applications. Both methods have their own advantages and limitations that can affect the effectiveness of their application depending on the specific context and needs. Comparison of Fuzzy Logic with SAW, namely:

1. Fuzzy Logic excels in handling data uncertainty and complex situations, such as in medical diagnosis [2] and software error prediction [10]. While SAW is more suitable for situations with certain data and predetermined weights, such as in determining exemplary students [11] and new student admission selection [12].
2. Fuzzy Logicdemonstrated versatility in a variety of fields, from medical diagnosis to intelligent navigation [13] and bee colony state detection [14]. While SAW is widely used in educational and industrial applications, providing fast and accurate solutions in student assessment [11] and manufacturing alternative selection [15].
3. Fuzzy Logicable to integrate risk factors and complex interactions, such as in the diagnosis of rheumatic diseases [16] and optimal location selection in agriculture [17]. While SAW relies on the determination of predetermined weights and simple mathematical calculations, such as in the selection of scholarship recipients [18] and the determination of employee bonuses [19].

Based on the findings of the above studies, the following are recommendations for using Fuzzy Logic and SAW in DSS:

1. **Use of Fuzzy Logic**
   - **Medical Diagnosis and Disease Prediction**

Fuzzy Logic is well suited for applications involving medical data uncertainty and disease prediction due to its ability to handle ambiguous and uncertain data.

   - **Non-Linear Decision Making**

Fuzzy Logic is effectively used in situations involving non-linear relationships between variables, such as in detecting the state of a honey bee colony.

2. **Use of SAW**
   - **Assessment and Selection**

SAW is suitable for use in the context of assessment and selection based on clear and measurable criteria, such as in selecting exemplary students, determining student majors, and determining employee bonuses.

   - **Integration with Other Methods**

SAW can be combined with other methods such as WP and BWM to improve the accuracy and effectiveness of decision making.

Comparison of strategic functions, namely the fuzzy logic method offers high flexibility in handling uncertain and complex data, and can be applied in various fields with very accurate and adaptive results. While the SAW method is simple and fast in implementation, suitable for applications that require quick decisions and based on clear and structured criteria. And the comparison of innovation, namely the fuzzy logic method emphasizes innovation in the ability to handle uncertainty and provide more personalized solutions, especially in medical applications and complex systems. While the SAW method lies in its ability to be combined with other methods (eg, WP, BWM) to improve accuracy and reliability in decision making.

Both methods, Fuzzy Logic and Simple Additive Weighting, have their own advantages and limitations in application to decision support systems. The choice of method depends on the complexity of the problem, data availability, and the specific needs of the application at hand. This systematic literature review shows that Fuzzy Logic is superior in handling uncertainty and complexity, while SAW offers simplicity and speed in structured decision making. The implementation of both methods provides valuable insights for the development of more effective and innovative decision support systems in various fields.

The results of this study have several limitations, namely the limitations of data and research context. Because the studies reviewed have a wide variety of contexts and applications, generalization of the results must be done carefully. And there is still a lack of direct comparative studies, so there are not many studies that directly compare the effectiveness of Fuzzy Logic and SAW in the same context. For future research, it is recommended to conduct a direct comparative study between Fuzzy Logic and SAW in the same context to gain a deeper understanding of the advantages and disadvantages of each method. Develop a hybrid method that combines the advantages of Fuzzy Logic and SAW to improve the accuracy and effectiveness of DSS. And expand the application of these two methods in various fields to explore their potential in different contexts.

5. CONCLUSION

Based on a comprehensive literature review of the 21 articles, it can be concluded that both Fuzzy Logic and Simple Additive Weighting (SAW) methods have their own advantages and disadvantages that make them suitable for different contexts in Decision Support Systems (DSS). It can be seen that:

- Fuzzy logic is able to handle uncertainty and ambiguous data, which often arise in the medical field, disease diagnosis, and intelligent navigation systems. For example, in medical diagnosis, fuzzy logic allows the integration of medical expertise that enriches the decision-making process.
- Fuzzy logic exhibits high flexibility in a wide range of application areas, including software error prediction, honeybee colony state identification, and road maintenance strategy selection.
- Fuzzy logic can integrate the interactions between various risk factors and symptoms in decision-making processes, such as in the diagnosis of rheumatic diseases and the selection of optimal agricultural locations.
- SAW is known for its simplicity and speed in decision-making processes. This allows for fast and efficient implementation, especially in educational contexts such as the selection of bawu student admissions and the determination of exemplary students.
- With predetermined weights, SAW provides objective and accurate decisions based on established criteria, such as in selecting scholarship recipients and employee bonuses.

- SAW has been used in a variety of contexts, from education, industry, to socio-economic analysis, demonstrating its broad adaptability.

In strategic function, Fuzzy Logic offers high flexibility in handling uncertain and complex data, and can be applied in various fields with very accurate and adaptive results. While SAW is simpler and faster in implementation, suitable for applications that require fast decisions based on clear and structured criteria. Fuzzy Logic puts forward innovation in the ability to handle uncertainty and provide more personalized solutions, especially in medical applications and complex systems. The innovation of SAW lies in its ability to be combined with other methods (eg, WP, BWM) to improve accuracy and reliability in decision making.

Choosing between Fuzzy Logic and SAW in DSS development depends largely on the context and specific needs of the application. For situations involving high uncertainty and complexity, fuzzy logic is a more appropriate choice. On the other hand, for applications requiring speed, simplicity, and certain data, SAW is a more effective solution. Proper implementation of both methods can improve the effectiveness and efficiency of decision support systems in various fields.

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