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A SAW-Based Decision Support System for Selecting Final Project Topics in the Informatics Management Department at STMIK Mulia Darma

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ABSTRACT

Selection of Final Project Topics is a crucial stage in the academic process, as it significantly affects the smoothness of project preparation and completion. However, the determination of final project topics often remains subjective and does not systematically consider students' academic abilities. This study aims to design and develop a Decision Support System for selecting final project topics for students in the Informatics Management Department using the Simple Additive Weighting (SAW) method. The SAW method is employed to evaluate and rank alternative topics based on several criteria, including supporting course grades, student interest, programming skills, system analysis and design capabilities, and the availability of supervising lecturers. The results indicate that the SAW method can provide objective and transparent recommendations for final project topics. Based on the calculation, alternative A4 achieved the highest preference score of 0.962, making it the most recommended final project topic. Therefore, the developed system is expected to assist both students and academic staff in making more effective and structured decisions regarding final project topic selection.

INTRODUCTION

The final project (Tugas Akhir) is a critical component in the academic process at higher education institutions, serving as a means to assess students' ability to integrate theoretical knowledge with practical skills acquired during their studies. Through the final project, students are expected to identify problems, analyze solutions, and present research findings in a systematic and scientific manner (Sommerville, 2016; Pressman & Maxim, 2014). Consequently, the selection of a final project topic represents a crucial initial stage, as it determines the direction of research, the methods to be employed, and the level of complexity in completing the study (Saaty, 2008; Turban et al., 2015).

In practice, many students face challenges in selecting final project topics that align with their interests, academic abilities, and technical competencies. Often, the chosen topics do not adequately consider the background of supporting courses or practical skills mastery, leading to various obstacles during the project execution. These challenges may result in difficulties in understanding research methods, obstacles in supervision, and delays in study completion (Sundari & Arifin, 2019; Yanto, 2020).

At the Informatics Management Department of STMIK Mulia Darma, the process of determining final project topics is still conducted conventionally. Students generally propose topics based on personal preference or supervisor suggestions without a system capable of evaluating multiple criteria objectively and systematically. This process is subjective because it heavily relies on individual experience and intuition, potentially leading to topics that are not well-suited to students' abilities (Kurniawan & Hartama, 2020; Indriyanti & Wahyuni, 2020). As a result, the quality of final projects produced is suboptimal and may not reflect the competencies of Informatics Management graduates.

With the advancement of information technology, higher education institutions are expected to leverage computer-based systems to support academic decision-making processes. One solution that can be implemented is a Decision Support System (DSS). DSSs are designed to assist decision-makers in solving semi-structured problems by utilizing data, models, and specific analytical methods (Turban et al., 2015; Nofriansyah, 2014). The implementation of DSS is expected to enhance objectivity, consistency, and accuracy in decision-making processes.

In higher education, DSS has been widely applied to support various academic processes, such as scholarship selection, student achievement determination, faculty performance evaluation, and the selection of

final project topics (Rochim & Kusrini, 2019; Windarto, 2018). The application of DSS in final project topic selection allows institutions to simultaneously consider multiple criteria, such as supporting course grades, student interests, programming skills, and topic relevance to the Informatics Management field (Sundari & Arifin, 2019).

One commonly used method in DSS is the Simple Additive Weighting (SAW) method. SAW is a multi-criteria decision-making approach that is simple and easy to understand. Its fundamental principle involves normalizing the values of each criterion and multiplying them by their respective importance weights to obtain a preference score for each alternative (Kusumadewi et al., 2010; Zimmermann, 2001). The alternative with the highest preference score is then recommended as the best option.

SAW is widely used due to its ease of implementation, computational efficiency, and ability to generate clear alternative rankings. Several studies have shown that SAW is effective in DSS applications across various domains, including education and management, providing transparent and easily interpretable decision outcomes (Windarto, 2018; Rochim & Kusrini, 2019). Other studies have demonstrated that SAW can be optimally applied in determining undergraduate thesis or final project topics based on relevant academic criteria (Siregar & Siahaan, 2019; Kurniawan & Hartama, 2020).

Based on these issues, a Decision Support System is needed to assist students of the Informatics Management Department at STMIK Mulia Darma in selecting final project topics that match their abilities, interests, and competencies. By utilizing the Simple Additive Weighting (SAW) method, the developed system is expected to provide objective and systematic recommendations for final project topics. In addition to supporting students in making informed decisions, this system is also anticipated to improve the effectiveness of academic processes and the quality of final projects produced (Indriyanti & Wahyuni, 2020; Yanto, 2020).

This study aims to design and develop a Decision Support System for final project topic selection in the Informatics Management Department using the SAW method. The results of this research are expected to contribute to the application of Decision Support Systems in higher education and serve as a reference for future studies related to multi-criteria decision-making.

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METHODS

Research methodology refers to the systematic steps used to achieve the objectives of a study in a structured and measurable manner. This research employs a Decision Support System (DSS) approach using the Simple Additive Weighting (SAW) method to assist in determining final project topics for students in the Informatics Management Department at STMIK Mulia Darma. DSS was selected because it is capable of handling multi-criteria decision-making problems objectively and consistently (Turban et al., 2015; Nofriansyah, 2014).

The research stages are arranged sequentially, starting from problem identification to system testing, as recommended in the development of software engineering-based systems (Pressman & Maxim, 2014; Sommerville, 2016). The research stages conducted in this study are as follows:

a. **Problem Identification**
   This stage aims to identify issues in the process of determining final project topics, which remain subjective and do not systematically consider academic criteria (Sundari & Arifin, 2019; Yanto, 2020).
b. **Literature Review**
   The literature review involves examining books and scholarly journals related to Decision Support Systems (DSS), the SAW method, and their applications in the field of education. This stage aims to obtain relevant theoretical foundations to support the research (Kusumadewi et al., 2010; Zimmermann, 2001).
c. **Data Collection**
   Data were collected through observations and interviews with lecturers and students. The data included alternative final project topics, evaluation criteria, and the importance weights of each criterion (Turban et al., 2015).
d. **Criteria and Weight Determination**

The criteria considered include supporting course grades, student interest, programming skills, and system analysis understanding. Each criterion is assigned a weight according to its level of importance in multi-criteria decision-making (Rochim & Kusrini, 2019; Indriyanti & Wahyuni, 2020).

e. **SAW Method Application**
The SAW method is applied to calculate and rank alternative final project topics due to its simplicity and ability to provide clear ranking results (Kusumadewi et al., 2010; Windarto, 2018).

f. **System Design and Implementation**
The system is designed and implemented following software engineering principles to ensure usability and ease of future development (Pressman & Maxim, 2014; Nugroho, 2010).

g. **System Testing**
Testing is conducted to verify the consistency of the system's calculations with manual SAW method calculations (Siregar & Siahaan, 2019).

h. **Result Analysis and Conclusion**.
The test results are analyzed to evaluate the effectiveness of the SAW method in determining final project topics (Kurniawan & Hartama, 2020).

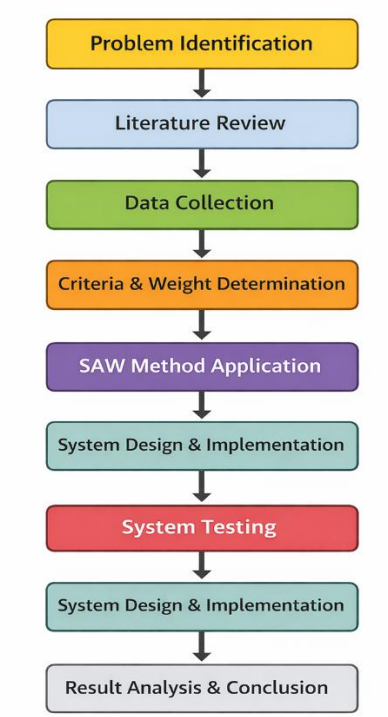

Figure 1. Research Flow

The research data consist of alternative titles for undergraduate theses and their corresponding evaluation criteria.

Table 1. Evaluation Criteria for Undergraduate Thesis Titles

Code	Criteria	Weight
C1	Supporting Course Grades	30%
C2	Student Interest	25%
C3	Programming Ability	20%
C4	System Analysis and Design	15%
C5	Availability of Supervising Lecturer	10%

The SAW method is a multi-criteria decision-making approach that calculates the weighted sum of each alternative's scores (Kusumadewi et al., 2010). The steps for applying the SAW method in this study are as follows (Windarto, 2018):

1. Determine the alternatives A_i.
2. Determine the criteria $C_j$and their respective weights w_j.
3. Construct the decision matrix $X = [x_{ij}]$.
4. Normalize the decision matrix.

The normalization formula for benefit criteria is:

$$r_{ij} = \frac{x_{ij}}{\max(x_{ij})} \qquad (1)$$

Next, calculate the preference value for each alternative:

$$V_i = \sum_{j=1}^{n} w_j \cdot r_{ij} \qquad (2)$$

The alternative with the highest $V_i$value is selected as the most recommended thesis title (Siregar & Siahaan, 2019).

The testing methods employed include functional testing of the system and calculation validation. Functional testing is conducted to ensure that each system feature operates correctly, while validation involves comparing the manual SAW calculations with the system-generated results (Turban et al., 2015; Sommerville, 2016).

RESULTS AND DISCUSSION

Results

Problem Solving Using the SAW Method

In this study, the process of determining undergraduate thesis titles for students of the Informatics Management Department was conducted using the Simple Additive Weighting (SAW) method. The SAW method was chosen because it can provide recommendations for the best alternative based on criteria and weights that have been objectively established. The problem-solving process involved evaluating each alternative thesis title according to academic criteria agreed upon by the academic staff.

The calculation steps began with the determination of criteria and their respective weights, assigning scores to each alternative based on the criteria, constructing the decision matrix, normalizing the matrix, and finally calculating the preference values to obtain the ranking of the most suitable thesis titles. This approach aligns with previous studies which indicate that the SAW method is effective for decision support systems because it produces clear and easily understandable alternative rankings.

Evaluation Criteria and Weights

Based on the results of the needs analysis, several criteria were established for determining undergraduate thesis titles. The criteria and their respective weights are presented in Table 2.

Table 2. Evaluation Criteria and Weights for Undergraduate Thesis Titles

Code	Criteria	Weight
C1	Supporting Course Grades	30%
C2	Student Interest	25%
C3	Programming Ability	20%
C4	System Analysis and Design	15%
C5	Availability of Supervising Lecturer	10%

The weights of the criteria were determined based on the level of importance of each criterion in relation to the successful completion of the undergraduate thesis. The criterion of supporting course grades received the highest weight as it is considered the most representative of the students' academic preparedness.

Evaluation of Undergraduate Thesis Title Alternatives

The alternatives in this study consist of several undergraduate thesis titles proposed by students. Each alternative was evaluated based on the predetermined criteria. The initial assessment results were then adjusted according to the criteria weights to form the decision matrix (X).

Table 3. Decision Matrix (X)

Alternative	C1	C2	C3	C4	C5
A1	80	75	70	75	80
A2	85	80	75	70	75
A3	75	85	80	80	70
A4	90	80	85	85	80

The values in the table indicate the degree of suitability of each alternative with respect to the corresponding criteria.

Normalization of the Decision Matrix

The decision matrix was then normalized using the normalization formula for benefit-type attributes, resulting in the normalized matrix (R). The normalization process aims to equalize the value scales across all criteria so that they can be fairly compared.

Table 4. Normalized Matrix (R)

Alternative	C1	C2	C3	C4	C5
A1	0.89	0.88	0.82	0.88	1.00
A2	0.94	0.94	0.88	0.82	0.94
A3	0.83	1.00	0.94	0.94	0.88
A4	1.00	0.94	1.00	1.00	1.00

Calculation of Preference Values and Ranking

The preference values were calculated by multiplying the normalized matrix with the weights of each criterion and then summing the results for each alternative. The calculation results of the preference values are presented in Table 5.

Table 5. Ranking Results of Alternatives

Alternative	Preference Value (Vi)	Rank
A1	0.884	3
A2	0.902	2
A3	0.895	4
A4	0.962	1

Based on the calculation results, alternative A4 obtained the highest preference value, making it the most recommended undergraduate thesis title that best aligns with the students' abilities and interests.

Discussion

The results of this study indicate that the SAW method is capable of providing objective recommendations for undergraduate thesis titles based on the predetermined criteria. The alternative with the highest preference value reflects the best alignment between the students' academic abilities and the characteristics of the selected thesis title. These findings are consistent with previous studies, which have demonstrated that the SAW method is effective in producing accurate and transparent decisions within decision support systems.

With the implementation of this system, students can obtain thesis title recommendations that better match their abilities, while the academic staff are assisted in guiding students, ensuring that the thesis preparation process is more effective and well-directed.

CONCLUSION

Based on the results of this study, the implementation of a Decision Support System using the Simple Additive Weighting (SAW) method is capable of providing objective and structured recommendations for undergraduate thesis titles. The calculation results indicate that alternative A4 obtained the highest preference value of 0.962, followed by alternative A2 with 0.902, A1 with 0.884, and A3 with 0.895. Therefore, alternative A4 is recommended as the most suitable undergraduate thesis title based on the established criteria and weights. These findings demonstrate that the SAW method is effective in supporting academic decision-making in an accurate and transparent manner.

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