

# Comparative Analysis of Saw and Topsis Methods in the Decision-Making System of Scholarship Recipients

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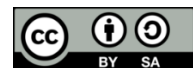
TOPSIS (Technique for Others Preference by Similarity to Ideal Solution)

SAW

## ABSTRACT

This research case study is on the Politeknik Harapan Bersama which will later be used for decision-making for scholarship recipient students. The purpose of this research is to make decisions for scholarship recipients. Previous research has conducted a Decision Making System (SPK) with the TOPSIS (Technique for Others Preference by Similarity to Ideal Solution) method, therefore this study will analyze the comparison of SPK with the SAW method and the TOPSIS method to find a better model in decision-making for scholarship recipients. It is hoped that later it will produce the right solution and know the comparison of the 2 best models in decision-making for scholarship recipients in this study, the implementation results will be displayed in the form of a website.

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## 1. INTRODUCTION

Politeknik Harapan Bersama Tegal is one of the largest campuses in the city of Tegal. The campus also provides scholarships for underprivileged students, one of the scholarships that is being researched is the Brebes Regency Government scholarship. The process of selecting msh manually and with a number exceeding 200 in each study program will only be taken by 2 people so that decision-making must be completely accurate.

While we know that a number of methods are commonly used in decision-making in matters related to multiple attribute decision making (MADM), such as simple additive weighting (SAW), weighted product (WP), TOPSIS, and analytic hierarchy process (AHP), two methods that are frequently used in decision-making are SAW

and TOPSIS. Previous research has also conducted a Decision Making System (SPK) with the TOPSIS method. In order to determine which of these two approaches is superior for decision-making, it is required to investigate them. SAW has the advantage of being able to assess more precisely because it is based on the value of criteria and weights, however Topsis has the advantage of having a straightforward and understandable idea. Both methods have their own advantages and both have the best assessments. [1]

Therefore, this study will utilize the SAW and TOPSIS methods in SPK and look for a better model in decision-making for scholarship recipients. It is hoped that later it will produce the right solution and find out the comparison of the 2 best models in decision-making for scholarship recipients.

## 2. LITERATURE REVIEW

Several studies for this decision-making system have been conducted by previous researchers.

The analysis of the decision support system in this study Tanjung Morawa addresses the selection of employee admissions at SMA AL Washliyah using the TOPSIS approach. The goal of a decision support system is to assist in decision-making by selecting from a variety of alternative options. It can solve problems effectively and efficiently. utilizing the Topsis approach in conjunction with staff admission decision support system software to streamline decision-making at Al Washliyah Tanjung Morawa High School [2].

The researcher claims that the Simple Additive Weighting (SAW) method, which is used in this study's decision support system for Bina Dharma University's bidik misi scholarship selection, can expedite the scholarship selection process. Grades, parental income, the number of dependents, and semesters are among the factors taken into consideration [3].

Additional research planning At PT. Indonesian Advertising Media, the topsis approach is used in the decision support system for staff performance reviews. An evaluation is required in order to raise employee performance or quality. Leadership and HRD can conduct employee assessments, including those that measure cooperation, discipline, attendance, loyalty, and accountability. Due to the lack of a system or methodology for the assessment, the issues with employee performance evaluation that have arisen thus far are still subpar. Consequently, the Technique for Others Reference by Similarity to Ideal Solution (TOPSIS) method must be used to develop a decision assistance system. Out of the available options, this approach can select the best one. Employees whose performance will be evaluated are the alternative in question. Finding out which professors perform the finest is the outcome of employing this strategy. A numerical value will be used to

determine which lecturer is the best, and the scores will be arranged from highest to lowest. With a preference value of 0.7270, employee 8 was chosen as the top performer out of the 23 employee options that were assessed, namely employees 1 through 23, Employee 8, with a preference value of 0.7270, was chosen as the best performer [4].

In this study, a system is designed that can determine the right home industry business in the midst of business competition, implementation using TOPSIS. The results of research from hsil testing show that the system is as expected specifications so that it can help users who are just starting a home industry business in determining the products to be sold [5].

In this study, we examine the traditional culinary of the typical South Kalimantan community, in this study we combine SAW and SMART in finding the best cuisine, The results of this study found that there are several South Kalimantan foods or culinary specialties that are still developing, based on the results of interviews and questionnaires are 4 criteria: Price (C1), Taste (C2), Ease of Access to Location (C3), Food Durability (C4) and the food products used are 4 Alternatives: Soto Banjar (V1), Peat Duck Rice (V2), Ketupat Kandungan (V3), Lontong Orari (V4). From the results of the calculation using the SAW Method, it was found that Soto Banjar culinary ranked first with a value of 0.889. and The results of the calculation using the SMART Method in Soto Banjar culinary ranked first with a value of 0.7 [6].

At This study is to determine the best teacher of the author using the Technique for Order by Similarity to Ideal Solution (TOPSIS), Simple Additive Weighting (SAW), and Weighted Product (WP) Method. The selection of the best teacher was assessed from 18 respondents, namely the Principal, 6 Educator Staff, 10 grade 9 students and 1 representative from the student's guardian. The criteria for selecting the best teachers are mastering teaching and learning, assessment and evaluation, getting to know the characteristics of students, curriculum development, work ethic and responsibility,

discipline, teacher-peer relationships, being inclusive, objective, and non-discriminatory, teacher-guardian relationships/school committees, and lastly, teamwork. The results of the implementation of these three methods on all criteria and sub-criteria of 5 teachers were assessed, so that Mrs. Yulia, S.Pd. received the best rating with a score of 0.707 (Topsis Method), 0.705 (SAW Method), and 0.231 (WP Method). And for the results of the comparison process between the TOPSIS, SAW, and WP methods, that WP is the most suitable method with a percentage of 99.998% than the TOPSIS and SAW methods [7].

AHP and TOPSIS were used in tandem to conduct the study. combinations that the decision support system can use. used with AHP to produce weighted results that are more objective. However, by comprehending the current ideas in the AHP and TOPSIS methodologies, the combination of TOPSIS and AHP can be applied to decision support systems with a variety of objects to be researched [8].

Based on research that has been carried out, the Decision Making System has many methods and each has its advantages and disadvantages, the research that is often carried out using TOPSis and also SAW each has good results, but to compare only the two methods is still unknown which method is the best.

### 3. METHODS

#### 3.1 Research Materials

The research material used in this study is a dataset in the form of data of 4th semester computer students domiciled in Brebes.

#### 3.2 Research Tools

The research tools used in this study include hardware and software. The following are the specifications of the tools used:

##### 3.2.1 Hardware

The hardware required includes: a computer with a minimum specification of a 1 GHz processor, 4 GB of RAM, and a 500GB SSD. A multifunction printer at least

equivalent to the Canon MP140 is equipped with a scanner.

##### 3.2.2 Software

In addition to hardware, software support is also required in conducting research. The software used includes:

- a. Visual Code
- b. Microsoft Office 2019
- c. XAMPP

#### 3.3 Research Procedure

The development of research procedures is carried out as follows:

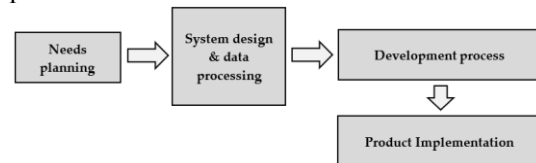


Figure 1. Research Procedure

##### 3.3.1 Needs Planning

This is the first phase of system development, during which issues are found and information gathered from users or user stakeholders is used to determine the system's ultimate goal and purpose as well as the information requirements that are needed.

##### 3.3.2 System Design and Data Processing

If there is still a design inconsistency with the user's needs that was discovered in the previous step, the design process and the design improvement process are repeated at this point. Additionally, SPK (Decision Making System) data processing

##### 3.3.3 Development process

At this point, the developed and approved system design is converted into an application form. At this point, it's also essential to keep working on development and integrating new components while keeping user or client feedback in mind. If all goes well, the process can move on to the next phase; if the application is unable to meet the requirements, the programmer will go back to the system design phase.

#### 4. Implementation

In this phase, the programmer implements the system design that was authorized in the preceding phase. To find problems in the system being produced, a testing procedure is initially conducted on the program before the system is put into use. It is

customary at this point to provide input on the developed system and obtain approval for it.

4. RESULTS AND DISCUSSION

4.1 Research Results

The results of the research conducted will be presented in this chapter. Here are the results

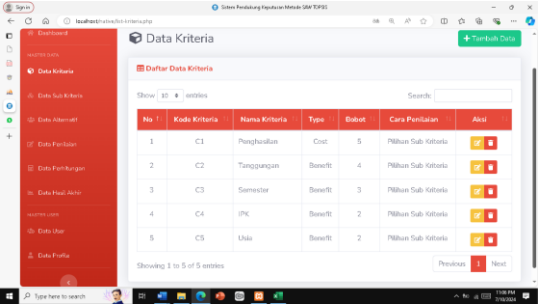


Figure 4.1 Criteria Data Display

At this stage, which is shown in figure 4.1, it is the determination of the criteria to be given the highest rank or value, which later this criterion will determine the calculation results.

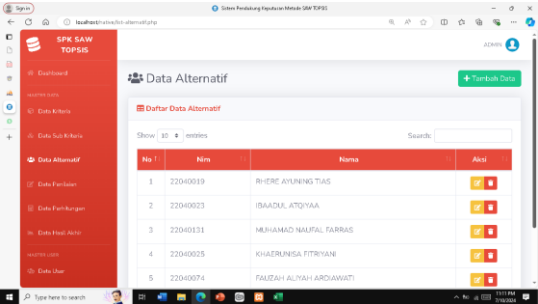


Figure 4.2 Alternative Data Views

At this stage, what is shown in figure 4.2 is the data of students who will take part in the selection

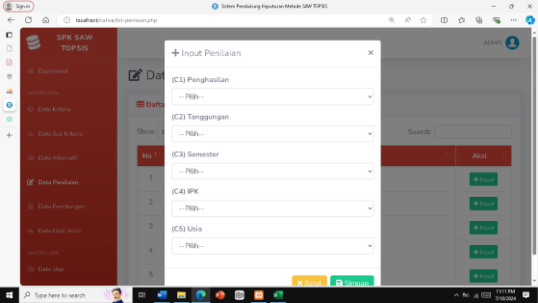


Figure 4.3 Assessment Form Display

At this stage, as shown in figure 4.3, is the assessment input display, the display in figure 4.3 is the assessment input which will

later determine whether the student is suitable or not.

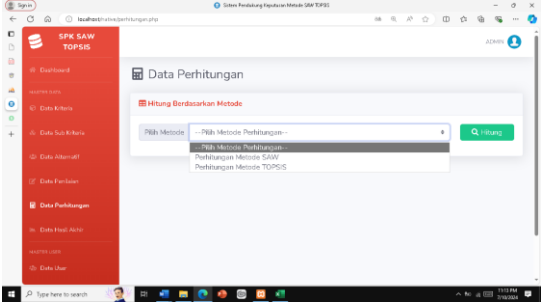


Figure 4.4 Calculation Process

At this stage, as shown in figure 4.4, is the display of the calculation data which we will later be asked to choose whether to use SAW or TOPSIS.

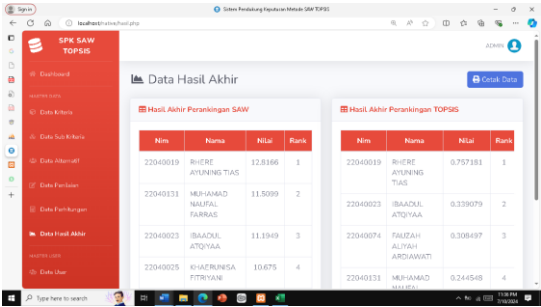


Figure 4.5 Result

At this stage as depicted in figure 4.5 at this stage displays the final result after the calculation process. From the results, it can be seen that the SAW or TOPSIS method has the greatest value, so it can be concluded that the alternative to be chosen, in other words Rhere Ayuning Tias will be chosen as the first option for scholarship recipients  $V_1V_3$ .

DISCUSSION

The discussion of the results of this study shows that the analysis carried out on SAW and TOPSIS gives satisfactory results. Data collection from students of the DIII Computer Engineering study program will later be selected using the results of research which will then be submitted to the campus student affairs section. The scholarships provided are limited to 20 scholarships for all study programs. After obtaining the data, then determining the criteria contained in figure 4.1 of the criteria, we divide the ranking with which weight is more effective, after providing the criteria, then we can fill out the assessment form. After all the requirements

are met, the calculation process is then entered.

The stages used in the calculation of each method are as follows:

#### **Calculation with SAW**

The settlement steps carried out are as follows:

- a. Establish the criterion,  $C_i$ , that will serve as a guide for decision-making.
- b. Calculate each alternative's match rating according to each criterion.
- c. To obtain a normalized matrix  $R$ , create a decision matrix based on criteria ( $C_i$ ) and then normalize the matrix using formulae tailored to the attribute type.
- d. As a result of the ranking procedure, the best alternative ( $A_i$ ) is chosen as the solution with the highest value, which is the sum of the normalized matrix  $R$ 's multiplication with the weight vector.

#### **Calculation with TOPSIS**

The settlement steps carried out are as follows:

- a. Calculating the Normalized Matrix
- b. Calculating the Named Matrix.
- c. Calculate the Positive Ideal Solution Matrix and the Negative Ideal Solution Matrix.
- d. Determining the Distance Between the Value of Each Alternative with the

Positive Ideal Solution Matrix and the Negative Ideal Matrix.

- e. Calculating the proximity relative to the ideal solution
- f. Ranking Alternatives

## **5. CONCLUSION**

The conclusions produced after this study was completed are as follows:

- a. Based on observations using the SAW and TOPSIS models, it can be seen that the two models have similarities in the problem-solving process.
- b. The implementation of the model in web applications provides practical solutions and easy access for users.
- c. It can make it easier to choose prospective scholarship recipients.

## **SUGGESTION**

The suggestions that can be given after this research activity is completed are as follows:

- a. Using other decision-making methods and comparing them with the SAW and TOPSIS methods.
- b. Integrate interactivity features within web applications, such as user feedback, to improve the user experience.
- c. Develop with different objects that are more complex.

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