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Original Research Paper

Selecting Favourite Majors at Sari Mulia University Using SAW Method

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Abstract: A decision support system, also known as a decision support system (DSS), is an interactive information system that offers data, models, and information. DSS is used as a decision aid in semi-structured and unstructured situations where there is no clear decision-making procedure. Determining the preferred major is one of the challenges in universities. The purpose of determining the most popular major is to improve the quality and services provided to students in each department, which is a crucial objective for universities. Currently, Universitas Sari Mulia determines the most popular majors based on qualitative data, which makes the determination of the most popular majors themselves inaccurate; therefore, a method capable of managing data on the selection of the most popular majors is necessary. In this study, the Simple Additive Weighting (SAW) technique will be utilized. This method is used to compare each criterion with one another in order to determine the most popular majors at Sari Mulia University and to evaluate each department.

Keywords: Decission Making, Decision Support System, SAW Method.

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1. Introduction

A decision support system, also known as a decision support system (DSS), is an interactive information system that offers data, models, and information. This system is used as a decision-making aid in semi- structured and unstructured situations where it is unclear how to proceed. The system consists of a collection of interconnected elements responsible for transforming inputs into outputs. Decisions are actions that select problem-solving strategies or actions [1].

The "favourite major" based on capacity refers to the study program's capacity, but it could also refer to university capacity. Determine the level of competition for admission to a university or study program based on the percentage of applicants who are accepted. Typically, the most popular study program is determined by the number of registrants, or it may be the program with the most registrants in the first choice. There is also a definition for the most popular and competitive study program [2].

A method that is frequently referred to as the weighted sum method is one that uses simple additive weighting. At Sari Mulia University, this method was developed in order to facilitate the decision-making process that is involved in selecting majors. It turns out that the choice of the most preferred major and its influence play an important role in the decisions that are made regarding career opportunities. This is in addition to the interest factor. The availability of jobs in a given field after graduation plays a significant role in determining which college major is selected, and the kinds of jobs that are available in a given field play a significant role in determining which college major is selected.

Several studies have been conducted on the most popular majors, such as SMA Negeri 8's study, which found that the method used to select favourite majors at SMA Negeri 8 is still qualitative in nature, so the process of selecting favourite subjects is also qualitative. Therefore, we need a method that can manage information about the choices of the most popular majors and perform a ranking calculation based on the weight of the most popular majors' choices. Why utilize a decision-making system? Because increasing student competition makes decision-making more challenging [3] [4].

According to Elistri et al [5], "a large number of workers have different skills, so it is necessary to select prospective students who meet the criteria and needs when recruiting new students." A decision support system employing the SAW (Simple Additive Weighting) method facilitates the selection of new students by assisting with the decision-making process. The Simple Additive Weighting (SAW) method can be used to select the most popular majors by solving quantitative problems. The SAW method is used to compare each criterion with the others in order to determine the most popular majors at Sari Mulia University and evaluate each department. The SAW method is therefore known as the weighted sum method. The fundamental concept of the SAW method is to calculate the weighted sum of each alternative's performance ratings across all attributes [6] [7].

2. Literature Review

Decision Support Systems (DSS) or Decision Support Systems (DSS) is an information system that is adaptable, interactive, and can be developed to provide information, modelling, and data manipulation in order to produce alternative decisions and aid management in dealing with various semi-annual problems situations both structured and unstructured [8] [9].

The system consists of interconnected elements responsible for processing input to generate output. Decisions involve selecting a strategy or course of action to address a problem. The purpose of the decision is to accomplish a particular objective or action.

The criteria or characteristics of the decision are [10]:

1. There are many choices or alternatives.
2. There are constraints or requirements.
3. Structured and unstructured patterns.
4. Multiple inputs or variables.
5. There are risk factors.
6. It takes speed and accuracy.

Numerous journals have been written about the selection of preferred majors, and some of them employ the SAW method. Similar to the research conducted by Mufizar [11] regarding the selection of popular majors, some of which employ the SAW method. Similar to the study, Decision Support System for Determining High School Majors Using the SAW Method [12] [13].

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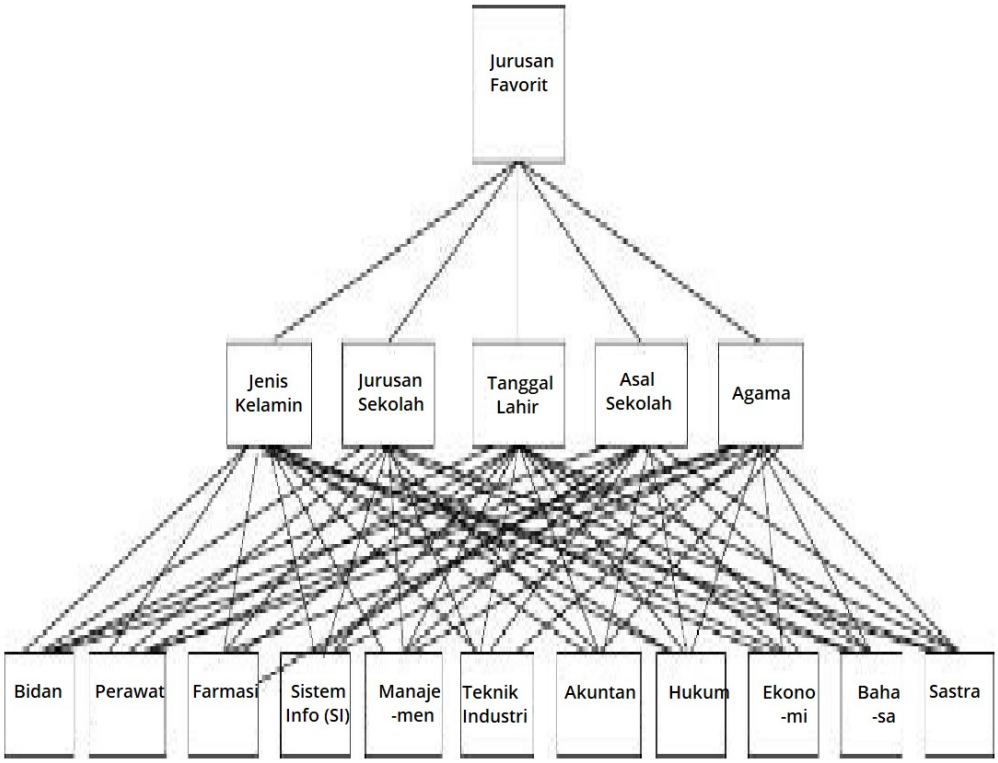

Figure 1. Characteristic of SAW

3. Methodology

This study employs a SAW-based decision support system. Weight of a Straight Forward Additive Frequently, the SAW method is also referred to as the weighted sum method [14]. The fundamental concept of the SAW method is to calculate the weighted sum of each alternative's performance ratings across all attributes. The SAW method is among the simplest and most popular fuzzy multi-attribute decision-making (MADM) techniques. In addition, this method is the simplest to implement because its algorithm is not overly complicated. This method necessitates that the decision-maker determine the relative importance of each attribute. The total score for alternative manufacturers is obtained by summing the products of all multiplications between ratings (which can be compared across attributes). The SAW method necessitates a procedure for normalizing the decision matrix (X) to a scale on which all existing alternative ratings can be compared [15] [16].

Table 1. Normalizing the Decision Matrix

Number of Students	Value Weight	Description Weight
96 - 125	5	Very Much
66 - 95	4	A lot
36 - 65	3	Enough
6 - 35	2	Less
Jn – 5	1	Very Less

where,
Each criterion is weighted as follows C1 = 5, C2 = 5, C3 = 4, C4 = 4, and C5 = 3.

The weight of each criterion is as follows Table 2.

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Table 2. Weight Criteria

No	Criteria	Weight
1	Number of Students	0.25
2	Gender	0.25
3	School majors	0.2
4	Date of birth	0.2
5	Religion	0.1

Determine the suitability rating of each alternative on each criterion shown in Table 3.

Tabel 3. Suitability Rating of Each Alternative

Alternative	C1	C2	C3	C4	C5
Midwifery	4	3	4	4	2
Pharmacy	4	5	4	4	3
Nursing	4	4	4	4	3
Promkes	3	4	4	4	3

1) Determine the criteria that will serve as a decision-making guide, namely the criteria (*Ci*).
2) Determine the rating of each alternative's suitability for each criterion.
3) Construct a decision matrix based on the criteria (*Ci*), then normalize the matrix based on the equation adjusted for the type of attribute (benefit attribute or cost attribute) in order to obtain a normalized matrix *R*.
4) The ranking process yields the final result, which is the sum of the normalized matrix multiplication R with the weight vector, with the largest value chosen as the optimal solution (*Ai*).

The normalization formula is as follows:

$$rij = \begin{cases} \dfrac{Xij}{MaxiXij} \\ \dfrac{MiniXij}{Xij} \end{cases} \quad (1)$$

rij : Normalized performance rating value.
xij : Attribute value owned from each performance.
Maxi xij : The maximum value of each criterion.
Mini xij : The minimum value of each criterion.
Benefit : If the maximum value is the best
Cost : If the minimum value is the best Where rij is the normalized performance rating of alternative *Ai* in attributes *Cj*; *i*=1, 2, …. , *m* dan *j*=1, 2, …., *n*.

The preference value for each alternative (*Vi*) is given as:

$$\text{Vi} = \sum_{j=i}^{n} wjrij \quad (2)$$

where,
Vi : The sequence for each alternative.
Wj : The weight value of each criterion.
rij : Normalized performance rating value. A larger *Vi* value indicates that the alternative *Ai* is preferred.

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4. Finding and Discussion

After the alternative rating values have been determined, the decision matrix [*x*] is constructed from the match rating table of each alternative on each criterion.

4.1. Create a Decision Matrix

Figure 2 shows the decision matrix.

$$\begin{bmatrix} 4 & 3 & 4 & 4 & 2 \\ 4 & 5 & 4 & 4 & 3 \\ 4 & 4 & 4 & 4 & 3 \\ 3 & 4 & 4 & 4 & 3 \end{bmatrix}$$

Gambar 2. Decission Matrix

In addition, each alternative's normalization value is computed as follows:

Alternative 1:

$$r_{11} = \frac{4}{Max\ \{4;4;4;3;\}} = \frac{4}{4} = 1.00$$

$$r_{12} = \frac{3}{Max\ \{3;5;4;4;\}} = \frac{3}{5} = 0.60$$

$$r_{13} = \frac{4}{Max\ \{4;4;4;4;\}} = \frac{4}{4} = 1.00$$

$$r_{14} = \frac{4}{Max\ \{4;4;4;4;\}} = \frac{4}{4} = 1.00$$

$$r_{15} = \frac{2}{Max\ \{2;3;3;3;\}} = \frac{2}{3} = 0.67$$

Alternative 2:

$$r_{21} = \frac{4}{Max\ \{4;4;4;3;\}} = \frac{4}{4} = 1.00$$

$$r_{22} = \frac{5}{Max\ \{3;5;4;4;\}} = \frac{5}{5} = 1.00$$

$$r_{23} = \frac{4}{Max\ \{4;4;4;4;\}} = \frac{4}{4} = 1.00$$

$$r_{24} = \frac{4}{Max\ \{4;4;4;4;\}} = \frac{4}{4} = 1.00$$

$$r_{25} = \frac{3}{Max\ \{2;3;3;3;\}} = \frac{3}{3} = 1.00$$

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Alternative 3:

$$r_{31} = \frac{4}{Max\ \{4;4;4;3;\}} = \frac{4}{4} = 1.00$$

$$r_{32} = \frac{4}{Max\ \{3;5;4;4;\}} = \frac{5}{4} = 0.80$$

$$r_{33} = \frac{4}{Max\ \{4;4;4;4;\}} = \frac{4}{4} = 1.00$$

$$r_{34} = \frac{4}{Max\ \{4;4;4;4;\}} = \frac{4}{4} = 1.00$$

$$r_{35} = \frac{3}{Max\ \{2;3;3;3;\}} = \frac{3}{3} = 1.00$$

Alternative 4:

$$r_{41} = \frac{3}{Max\ \{4;4;4;3;\}} = \frac{3}{4} = 0.75$$

$$r_{42} = \frac{4}{Max\ \{3;5;4;4;\}} = \frac{4}{5} = 0.80$$

$$r_{43} = \frac{4}{Max\ \{4;4;4;4;\}} = \frac{4}{4} = 1.00$$

$$r_{44} = \frac{4}{Max\ \{4;4;4;4;\}} = \frac{4}{4} = 1.00$$

$$r_{45} = \frac{3}{Max\ \{2;3;3;3;\}} = \frac{3}{3} = 1.00$$

4.2. Ranking

The final result of calculating the preference value (v1) is the sum of the multiplication of the normalized matrix row elements (R), using the following weights:

V1 = (0.25 x 1.00) + (0.25 x 0.60) + (0.20 x 1.00) + (0.20 x 1.00) + (0.10 x 0.67)
= 0.25 + 0.15 + 0.20 + 0.67
= 0.867

V2 = (0.25 x 1.00) + (0.25 x 1.00) + (0.20 x 1.00) + (0.20 x 1.00) + (0.10 x 1.00)
= 0.25 + 0.25 + 0.20 + 0.20 + 0.10
= 1.00

V3 = (0.25 x 1.00) + (0.25 x 0.80) + (0.20 x 1.00) + (0.20 x 1.00) + (0.10 x 1.00)
= 0.25 + 0.20 + 0.20 + 0.20 + 0.10
= 0.95

V4 = (0.25 x 0.75) + (0.25 x 0.80) + (0.20 x 1.00) + (0.20 x 1.00) + (0.10 x 1.00)
= 0.1875 + 0.20 + 0.20 + 0.20 + 0.10
= 0.8875

Table 4. Rangking

Alternative		Final Result	Percentage	Ranking
Midwifery	0.867	0.23404	23%	4
Pharmacy	1	0.26994	27%	1
Nursing	0.95	0.25644	26%	2
Promkes	0.8875	0.23957	24%	3
TOTAL	3.7045	1	100%	

V2 has the highest value among V1, V2, V3, and V4, so V2 = Pharmacy with a 27% yield has been selected as the most popular major at Sari Mulia University.

5. Conclusion

Quantitative data, such as the number of students, gender, school majors, date of birth, and religion from each department, including midwifery, nursing, pharmacy, and health promotion, can be used to determine the most popular majors at Sari Mulia University. The simple additive weight method can be used to determine the most popular major at Sari Mulia University; therefore, the Pharmacy major with a final yield of 27% is the most popular major.

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