



DECISION SUPPORT SYSTEM FOR SELECTING BOARDING HOUSES FOR STUDENTS IN GRESIK USING THE SAW (SIMPLE ADDITIVE WEIGHTING) METHOD

Rizki Marthanugraha^a

^a Teknik / Teknik Informatika, rizkimartha123@gmail.com, Universitas Muhammadiyah Gresik, Gresik Jawa Timur
*Korespondensi

ABSTRACT

Boarding houses or commonly called kos are one of the places that provide accommodation services or temporary residences consisting of several rooms where each room has facilities that have been provided by the boarding house owner. For students who study far from their hometown, of course they need a boarding house. In the process of selecting a boarding house, students studying in Gresik often experience difficulties and obstacles in selecting the boarding house because there are several criteria and factors that must be met such as location, price, facilities, and also security. To overcome the above problems, a system is needed to help students in Gresik as recommendations and also find information about boarding houses in Gresik. Therefore, a method was chosen from several existing methods, namely the Simple Additive Weighting (SAW) method. This method will later produce the largest value that will be selected as the best alternative by taking into account the existing criteria.

Keywords: Boarding Houses, SPK, SAW, Gresik, Alternative.

1. INTRODUCTION

Along with the many students who come from outside the city of Gresik who want to study in Gresik, many boarding houses have emerged, competing to attract tenants by offering various facilities, competitive prices, strategic locations, and safety guarantees. This abundance of options often leaves students confused when choosing a boarding house that meets their needs. To address this, a Decision Support System (DSS) is needed to assist students in selecting temporary housing or boarding houses based on criteria such as facilities, price, location, and security.

A Decision Support System (DSS) is a tool designed to provide problem-solving capabilities and facilitate communication in situations with semi-structured or unstructured problems. It aids decision-making in cases where there is no definitive process for determining solutions. The primary goal of a DSS is to offer information, guidance, predictions, and directions to help users make better decisions. It implements decision-making theories from disciplines such as operations research and management science. Unlike traditional methods requiring manual calculations to determine minimum, maximum, or optimal values, DSS leverages computer systems to deliver solutions more efficiently.

The Simple Additive Weighting (SAW) method is a widely used decision-making approach within DSS. It is known for its precision and accuracy in assessments, as it evaluates alternatives based on predetermined criteria and weight values. The SAW method is particularly effective in solving problems like selecting high-performing employees or determining the best options among alternatives. It calculates a weighted sum of performance ratings across all attributes and involves normalizing the decision matrix (X) to a comparable scale for all alternatives (Novita Sari, 2019).

2. RESEARCH METHODS

In the SAW method, this method is also called the weight summation method. Where this method starts from finding the weight value by looking at the alternatives of all attributes.

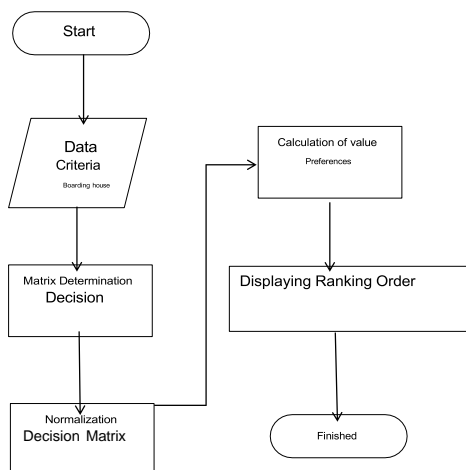


Figure 1 Design Analysis

At first we determine the data based on existing criteria, namely the criteria

- a. Location, Price, Facilities, and Security.
- b. Determine the Decision Matrix based on the criteria.
- c. Perform Matrix Normalization based on equations adjusted to attributes.
- d. After calculating the preference values, rank them by sorting them from the largest preference value to the smallest.

The calculation formula for benefit and cost attributes is as follows (1):

$$R_{ij} = \frac{X_{ij}}{\text{Maxi } X_{ij}} \quad \text{If } j \text{ is a benefit attribute}$$

$$R_{ij} = \frac{\text{Mini } X_{ij}}{X_{ij}} \quad \text{If } j \text{ is the cost attribute}$$

With the following information:

- Benefit = the greater the value, the better
- Cost = the smaller the value, the better
- =maximum/very large value in row i column j
- =minimal/very small value in row i column j
- R_{ij} = Normalized performance rating
- =Values in row i and column j

The preference value for each alternative (V_i) is defined by an equation such as in Equation (2):

$$V_i = \sum_{j=1}^n W_j R_{ij} \quad \text{With Description:} \quad (2)$$

- V_i = Total preference value per alternative
- W_j = Author-defined weighted score
- R_{ij} = normalized performance rating score

A larger V_i value indicates that the alternative A_i is more preferred. This method is the most well-known and most widely used method in dealing with situations Multiple Attribute Decision Making (MADM). (Syahrudin & Yunita, 2021).

3. RESULTS AND DISCUSSION

3.1. Determination of Criteria

Criteria required in calculating the SAW method

- a. Weight

Table 1 Criteria

Criteria ©	Information	Types of Criteria
------------	-------------	-------------------

C1	Location	Cost
C2	Price	Cost
C3	Facility	Benefits
C4	Security	Benefits

From the Criteria in table 1, the criteria weight is determined in fuzzy numbers. The criteria weight rating is as in table 2.

Table 2 Weight

Levels	Weight Value
4	Very Good
3	Good
2	Enough
1	Not Enough

b. Location Criteria

Table 3 Location

C1	Mark
Very Close to Campus	4
Close Enough to Campus	3
Far from Campus	2
Very Far from Campus	1

c. Price Criteria

Table 4 Price

C2	Mark
<500,000	4
> 500,000 and > 600,000	3
700,000	2
<700,000	1

d. Facility Criteria

Table 5 Facility

C3	Mark
AC, parking, private bathroom, TV, Wifi	4
Parking space, en-suite bathroom, TV, fan	3
En suite bathroom, TV, fan	2
Outside bathroom, fan	1

e. Security Criteria

Table 6 Security

C4	Mark
Very Safe	4
Safe Enough	3
Safe	2
Less Secure	1

f. Weight vector

The weight vector is defined to have importance values as in the table.

Table 7 Weight Vector

Criteria ©	Mark
C1	20
C2	15
C3	15
C4	20

g. The alternative we use is as follows:

- A1= Boarding house 1
- A2= Boarding house 2
- A3= Boarding house 3
- A4= Boarding house 4

3.2. Matrix Normalitation

The following is the data obtained after conducting a survey. The data is defined in table 8.

Table 8

Alternative	Criteria			
	C1	C2	C3	C4
Boarding House 1	4	3	2	3
Boarding House 2	4	2	4	2
Boarding House 3	2	4	3	1
Boarding House 4	3	2	1	4

Based on the table above, the decision matrix X can be made as follows:

$$X = \begin{bmatrix} 4 & 3 & 2 & 3 \\ 4 & 2 & 4 & 2 \\ 2 & 4 & 3 & 1 \\ 3 & 2 & 1 & 4 \end{bmatrix}$$

Then calculate using equation (1) above.

a. Criteria 1 cost

$$R11 = \frac{\min(4,4,2,3)}{4} = \frac{2}{4} = 0.5$$

$$R21 = \frac{\min(4,4,2,3)}{4} = \frac{2}{4} = 0.5$$

$$R31 = \frac{\min(4,4,2,3)}{2} = \frac{2}{2} = 1$$

$$R41 = \frac{\min(4,4,2,3)}{3} = \frac{2}{3} = 0.66$$

b. Criteria 2 cost

$$R12 = \frac{\min(3,2,4,2)}{3} = \frac{2}{3} = 0.66$$

$$R22 = \frac{\min(3,2,4,2)}{2} = \frac{2}{2} = 1$$

$$R32 = \frac{\min(3,2,4,2)}{4} = \frac{2}{4} = 0.5$$

$$R42 = \frac{\min(3,2,4,2)}{2} = \frac{2}{2} = 1$$

c. Criteria 3 benefit

$$R13 = \frac{2}{\max(3,4,3,1)} = \frac{2}{4} = 0.5$$

$$R23 = \frac{4}{\max(3,4,3,1)} = \frac{4}{4} = 1$$

$$R33 = \frac{3}{\max(3,4,3,1)} = \frac{3}{4} = 0.75$$

$$R43 = \frac{1}{\max(3,4,3,1)} = \frac{1}{4} = 0.25$$

d. Criteria 4 benefit

$$R14 = \frac{3}{\max(3,2,1,4)} = \frac{3}{4} = 0.75$$

$$R24 = \frac{2}{\max(3,2,1,4)} = \frac{2}{4} = 0.5$$

$$R34 = \frac{1}{\max(3,2,1,4)} = \frac{1}{4} = 0.25$$

$$R44 = \frac{4}{\max(3,2,1,4)} = \frac{4}{4} = 1$$

After following: If the X matrix is normalized, the Y matrix will be obtained as following :

$$Y = \begin{bmatrix} 0,5 & 0,66 & 0,5 & 0,75 \\ 0,5 & 1 & 1 & 0,5 \\ 1 & 0,5 & 0,75 & 0,25 \\ 0,66 & 1 & 0,25 & 1 \end{bmatrix}$$

3.3. Calculating alternative weight vectors

Then perform calculations with the weight vector [20,15,15,20] using equation (2) above.

$$V1 = (0,5 \times 20) + (0,5 \times 15) + (1 \times 15) + (0,66 \times 20) = 10 + 7,5 + 15 + 13,2 = 45,7$$

$$V2 = (0,66 \times 20) + (1 \times 15) + (0,5 \times 15) + (1 \times 20) = 13,2 + 15 + 7,5 + 20 = 55,7$$

$$V3 = (0,5 \times 20) + (1 \times 15) + (0,75 \times 15) + (0,25 \times 20) = 10 + 15 + 11,25 + 5 = 41,25$$

$$V4 = (0,75 \times 20) + (0,5 \times 15) + (0,25 \times 15) + (1 \times 20) = 15 + 7,5 + 3,75 + 20 = 46,25$$

3.4. Doing Ranking

After calculating the weight vector, ranking is carried out as in table 9.

Tabel 9

No.	Boarding House	Ranking
1	Boarding House 2	1
2	Boarding House 4	2
3	Boarding House 1	3
4	Boarding House 3	4

4. CONCLUSION

After conducting the design and implementation along with testing, the following conclusions were obtained: By using the Decision Support System Simple Additive Weighting (SAW) method in determining the boarding house, the results obtained are that the search for boarding houses becomes easier and can help students in Gresik in determining the desired boarding house based on the criteria. The system that has been developed can minimize errors in selecting a boarding house.

REFERENCES

- [1] (2019). Application of Simple Additive Method Weighting In Choosing A Boarding House. 5(2), 215–226.
- [2] Muhlis, La Ode. Kurni, Samuel . & Hasbi (2020). Decision Support System for Determination of Priority for Tourism Destination Development in Manokwari Regency Using the Simple Additive Weighting (Saw) Method 3(02) 27-37. (Muhlis, La Ode, Kurni; Samuel & Hasbi, 2020).
- [3] Ali Ubed, Imanullah. Anugrah, Indra Gita. Rosyid, Harunur (2021). A System Supporting Priority Decisions for EDP-IT Installation Improvements Using the MOORA Method at Muhammadiyah Hospital Gresik 3(01) 10-20. (Ali Ubed Imanullah, Indra Gita A; Harunur Rosyid, 2021).
- [4] Surya Mahendra, Gedhe & Yota Ernanda Aryanto, Kadek (2019). DSS Determination ATM Location Using AHP and SAW Methods 5(1). (Surya Mahendra Gedhe, Yota Ernanda; Aryanto Kadek, 2019).
- [5] Adriantama, Tengku & Brianorman, Yulrio (2021). Decision Support System In the Selection of Student Housing (Boarding House) Using the Simple Additive Weighting (Saw) Method 4(1), 1-7. (Adriantama Tengku, Brianorman, 2021).

- [6] Agung Saputro, Jarwoko & Nita, Sekreningsih (2021). Decision Support System Hotel Selection During the Covid-19 Pandemic in Madiun City Using the Saw (Simple Additive Weighting) Method 149-163. (Jarwoko Agung Saputro, Sekreningsih Nita, 2021).
- [7] Leyla Rahmah, Dewi (2021). Eligibility Decision Support System for Recipients Grant Fund Assistance Using the Saw Method (Simple Additive Weighting) 2(1),31- 40. (Dewil Leyla Rahmah, 2021).
- [8] Fathoni, M. Yoka. Darmansah, & Januarita, Dwi (2021). Decision Support System Selection of Exemplary Students Using the Simple Additive Weighting (SAW) Method at Telkom Purwokerto Vocational School 10(3) 346-353. (M Yoka Fathoni & Januarita, 2021).
- [9] Syahrudin, Syahrudin, & Yunita, Selviana. (2021). Decision Support System Selection of Boarding Houses Using the Simple Additive Weighting (SAW) Method in East Kotawaringin. CLICK: Scientific Study of Informatics and Computers, 2(2), 84– 87.
- [10] Safitri, Mulia, Sagit Sahay, & Lestari (2021). Implementation of the Simple Additive Method Weighting in the Decision Support System for Recipients of Basic Food Assistance Program 1(1) 87-96. (Mulia Safitri, Abertun Sagit Sahay, Ariesta Lestari, 2021).