Instal : Jurnal Komputer

E-ISSN: 2808-683X
Edisi : Volume 17 Nomor 03 | 2025

Available online at https://journalinstal.cattleyadf.org/index.php/Instal/index

Decision Support System for Foundation Beneficiaries Using the Simple Additive Weighting (SAW) Method

Herpendi[1], Mamed Rofendy Manalu[2]
Politeknik Negeri Tanah Laut

ARTICLE INFO

Article history:

Received : 04 April 2025
Revised : 13 April 2025
Accepted : 21 April 2025

Keywords:
Decision Support System, Compensation, SAW Method.

ABSTRACT

The distribution of compensation funds for underprivileged students must be based on clear and objective selection mechanisms to ensure that assistance is allocated to the most deserving recipients. A Decision Support System (DSS) provides a systematic and efficient method to support this selection process. This research utilizes the Simple Additive Weighting (SAW) method to develop a DSS that ranks students based on predefined criteria such as parents' income, family status, number of dependents, and academic achievement. The ranking results indicate that Farhan Rifai scored the highest (0.8), followed by Sidratul Muntaha (0.7666), demonstrating the method's effectiveness in supporting fair compensation distribution.

Corresponding Author:
Herpendi
Politeknik Negeri Tanah Laut
Email:herpendii@gmail.com

INTRODUCTION

In a society that upholds the values of compassion and social justice, providing financial assistance to underprivileged groups, especially students, has become an important moral and social obligation. One such form of assistance is compensation a fund distributed by charitable organizations or foundations to ease the economic burden of students who come from low-income families, are orphans, or face other forms of social vulnerability. The MDTA Nurul Ikhwan Foundation, like many similar institutions, conducts annual compensation programs aimed at helping students from disadvantaged backgrounds. However, in its current form, the selection process is still handled manually through ledgers and basic data recording, leading to inefficiencies, subjectivity, and potential inaccuracies. The manual nature of this process presents several challenges. First, the foundation must ensure that only students who meet a specific set of criteria are selected to receive compensation. Second, the process must remain transparent and fair, especially when allocating limited funds to only 10% of students in each class annually. Third, the absence of a computerized system results in time-consuming administrative tasks and increases the likelihood of human error in decision-making. To address these challenges, this study proposes the implementation of a Decision Support System (DSS) using the Simple Additive Weighting (SAW) method. DSS is a category of information system designed to assist decision-makers by processing data and applying structured methods to generate recommendations or decisions. The SAW method, in particular, is a widely recognized

Page : 134-139
Doi. 10.54209/jurnalinstall.v17i03.367

Multi-Attribute Decision Making (MADM) technique that ranks alternatives based on the weighted sum of their performance ratings across a set of criteria. This method is suitable for problems involving multiple conflicting attributes—such as economic status, family condition, and academic performance—where trade-offs are necessary to determine the best candidates. In this context, the SAW method is used to evaluate and rank students based on four key criteria: (1) parents' income, (2) family status (e.g., orphaned), (3) number of dependents in the family, and (4) academic achievement. These criteria are assigned specific weights that reflect their importance in the decision-making process. Through normalization and aggregation of performance scores, the system calculates a final score (preference value) for each student, allowing the foundation to objectively select the most eligible recipients. This research aims to contribute not only to the operational effectiveness of the MDTA Nurul Ikhwan Foundation but also to the broader discourse on leveraging information systems for equitable resource allocation. By demonstrating the practical application of the SAW method in a real-world setting, this study offers a replicable model for other institutions seeking to improve fairness, transparency, and efficiency in their social assistance programs.

METHODS

Decision Support System

Basically DSS is almost the same as SIM because it uses a database as a data source[11]. DSS originates from MIS because it emphasizes the function of supporting decision makersat all stages, although the actual decision remains the exclusive authority of the decision maker. A class of computerized information systems at a higher level is the Decission Support System (DSS).[12]. DSS is almost the same as traditional MIS in that they both depend on a database as a data source. Although the actual decision is still the exclusive authority of the decision maker.

Simple Additive Weighting

The Simple Additive Weighting (SAW) method is often also known as the weightedaddition method[13]. The basic concept of the Simple Additive Weighting (SAW)method is to find the weighted sum of the performance ratings on each alternative on all attributes[14].

$$\mathbf{r}_{ij} = \begin{cases} \dfrac{\boldsymbol{X_{ij}}}{\boldsymbol{max\ X_{ij}i}} & \text{If j is an attribute of benefit (Benefit)} \\ \dfrac{\boldsymbol{min\ X_{ij}i}}{\boldsymbol{X_{ij}}} & \text{If j is the cost attribute (Cost)} \end{cases} \quad \text{----------(1)}$$

Where rij is the normalized performance rating of alternative Ai on attribute Cj; i=1,2,…,m and j=1,2,…,n. The preference value for each alternative (Vi) is given:

rij = Normalized work rating.
maxi = maximum value of each row and column. *mini*
= the maximum value of each row and column.*Xij*
= rows and columns of the matrix.

*(rij)*is the normalized performance rating of the alternative (Ai) on the attributes (Cj) i= 1,2…,m and j= 1,2…,n.

$$\boldsymbol{V_i} = \sum^{n}_{\boldsymbol{j=1}}$$

Page : 134-139
Doi. 10.54209/jurnalinstall.v17i03.367

$$W_j r_{ij} \quad \text{.....(2)}$$

A larger Vi value indicates that alternative Ai is preferred.
Where :
Vi = final value of the alternative.
Wi = predetermined weight.
rij = matrix normalization
a larger value indicates that the alternative is preferred.

There are several steps in completing the Simple Additive Weighting (SAW) method. Which is applied as follows:

1. Determine the criteria used as a reference in decision support, namely Ci.
2. Determine the suitability rating of each alternative on each criterion.
3. Make a decision matrix based on the criteria (Ci).
4. Then normalize the matrix based on the equation that is adjusted to the type of attribute (profit attribute or cost attribute) in order to obtain a normalized matrixR.
5. The final result is obtained from the ranking process, namely the addition of the normalized matrix multiplication R with the weight vector so that the largest value is chosen as the best alternative (Ai) as the solution.

Annual Period Foundation Compensation

Compensation is a form of our concern for fellow creatures of God which should be carried out sincerely and voluntarily[15]. Compensation is a fund allocated and issued by an agency/foundation to underprivileged people such as orphans. Foundation compensation for the annual period is a fund in the form of assistance allocated and issued by a foundation to underprivileged students and the provision of compensation is carried out on an annual/periodic period every year.[16]. Compensation provided by the foundation to students with various criteria/alternatives that will be a reference in providing compensation. The criteria/alternatives for receiving foundation compensation include:

1. Students who are less well off in the family economy (amount of parents' income).
2. Students with family status, namely: orphans, orphans and orphans.
3. Students with how many children their parents depend on.
4. Students who excel / win from grade 2 to grade 6.

RESULTS & DISCUSSION

Application of the SAW Method

In determining students who are entitled to receive compensation at the MDTA Nurul Ikhwan Foundation, the school/foundation selects students-student and those who are entitled to become students who receive foundation compensation for the annual period with predetermined criteria. One of the solutions to the FMADM problem, criteria and weights are needed in carrying out the calculations so that the best alternative will be obtainedare as follows :

Determining each of the criteria can be seen in the table below:

Table 1. Code and Criteria Terms

Code	Criteria	Attribute
C1	Parents' Income	Benefits
C2	Family Status	Benefits

Page : 134-139
Doi. 10.54209/jurnalinstall.v17i03.367

C3	Parental Dependence	Cost
C4	Student Achievement	Benefits

Furthermore, decision makers give preference weights to each criterion as W as shown intable 2:

Table 2. Determination of W . Value

Criteria	Range (%)	Weight
C1	40	0.40
C2	25	0.25
C3	20	0.20
C4	15	0.15

Criteria for the amount of parental income.

Table 3. Parental Income Criteria

Parent's income (C1)	Variable	Score
C1<= IDR 500,000	Very high	1
C1> IDR 500 thousand <C1 <= IDR 1million	Tall	0.75
C1> IDR 1 million <C1 <= IDR 1.5 million	Currently	0.50
C1> IDR 1.5 million <C1 <= IDR 2.5 million	Low	0.25
C1> IDR 2.5 million	Very low	0

Status criteria in the family

Table 4. Criteria for Family Status

Family Status (C2)	Variable	Score
Orphans	Very high	1
Orphans	Tall	0.75
Orphans	Currently	0.50

Table 5. Student Data Submitted

Alternative	Criteria			
	Parents' Income	Family Status	Parental Dependence	Student achievement
1	IDR 500,000	orphan	3 children	2
2	IDR 800,000	orphan	2 children	4
3	IDR 1,000,000	Orphan	4 kids	1
4	IDR 1,400,000	orphan	3 children	3
5	IDR 2,500,000	orphan	4 kids	2

The sample above is data from students who become alternatives, namely, A1 (Farhan Rifai), A2 (Syashi Ajeng Sachira), and A3 (Sidratul Muntaha), A4 (Aqila Zahra Daulay), and A5 (Alif Putra Kelana).

Doi. 10.54209/jurnalinstall.v17i03.367

The ranking calculation value for each alternative with a value of Vi can be seen in the following table:

Table 6. Ranking Calculation Results

Alternative	Vi	Rank
A1	0.8	1
A2	0,6625	3
A3	0.7666	2
A4	0.5	4
A5	0, 4666	5

From the calculation above, the first order is Farhan Rifai with a value of 0.8; second placeis Sidratul Muntaha with a value of0.7666; Syashi Ajeng Sachira with grades0.6625; fourth place is Aqila Zahra Daulay with a value of0.5 and the last order is Alif Putra Kelana witha value of 0.4666.

CONCLUSION

This research demonstrates that a Decision Support System utilizing the SAW method can effectively support the selection of foundation compensation recipients. By using criteria such as parents' income, family status, number of dependents, and academic achievements, the system assigns weighted scores to each student. The normalized performance ratings and preference values help identify the most deserving candidates in an objective manner. The final rankings show Farhan Rifai in first place with a score of 0.8, followed by Sidratul Muntaha (0.7666), and Syashi Ajeng Sachira (0.6625). The implementation of this DSS contributes to a more accurate, efficient, and just distribution of aid.

REFERENCES

[1.] ED Sri Mulyani, "Comparative Analysis of Decision Support Systems Using the
[2.] SAW Method With WP In Loans," CogITo Smart J., vol. 5, no. 2, 2019, doi:10.31154/cogito.v5i2.151239-251.
[3.] H. Abijono, "Comparative Analysis of Simple Additive Weighting and Fuzzy Algorithms in Decision Support Systems," LIGHTtech, vol. 7, no. 1, 2019, doi:10.47047/ct.v7i1.5.
[4.] Fitriani, Ilyas, and Bayu Rianto, "DECISION SUPPORT SYSTEM OF GRANTING ASSISTANCE TO FISHERMEN GROWS BY THE MARINE AND FISHERIES DEPARTMENT," J. SOFTWARE, vol. 1, no. 1, 2019,doi:10.32520/jupel.v1i1.778.
[5.] B. Suprapty, LD Utami, and ABW Putra, "SELECTION OF PROSPECTIVE SCHOLARSHIP RECIPIENTS PT. ADIMITRA BARATAMA NUSANTARA USING SIMPLE ADDITIVE WEIGHTING METHOD,"POSITIVE J. Sist. and Technol. inf., vol. 5, no. 2, 2019, doi:10.31961/positive.v5i2.791.
[6.] GYKSS Pahu, "DECISION SUPPORT SYSTEM FOR SELECTING RECIPIENTS OF POOR STUDENT AID USING THE SIMPLE ADDITIVE WEIGHTING (SAW) METHOD," Expert J. Manaj. Sis. inf. and Technol., vol. 8, no. 2, 2018, doi:10.36448/jmsit.v8i2.1116.
[7.] WY Arkadia and EH Parmadi, "Decision Support System for Determining Mck Development Funds Using Fuzzy Simple Additive Weighting," CogITo Smart J., vol. 3, no. 2, 2018, doi:10.31154/cogito.v3i2.76.263-274.
[8.] AO Riyandi, N. Dengen, and Islamiyah, "Decision Support System for the Eligibility of Providing Funds or Credit Assistance for Small and Medium Enterprises (SMEs) at

Bank Negara Indonesia (BNI)," Pros. SAKTI (Seminar on Computing and Information Technology), vol. 2, no. 1, 2017.
[9.] MY B2042141012, "INFLUENCE OF QUALITY PERCEPTIONS, ATTITUDE TO TV ADVERTISING AND BRAND IMAGE TOWARDS REPURCHASING INTENTION (Study on Consumers of Indomie Brand Instant Noodles in PontianakCity)," Equator J. Manag. Entrep., vol. 8, no. 1, 2019, doi:10.26418/ejme.v8i1.35743.
[10.] D. Pertiwi and K. Kusmanto, "Scholarship Admission System at Al-Washliyah University Labuhanbatu Using the SAW (Simple Additive Weighting) Method," U-NET J. Tek. information., vol. 3, no. 1, 2019, doi:10.52332/u-net.v3i1.177.
[11.] DS Purnia, L. Lena, and R. Ratningsih, "Information System for Determining PKH Candidates Using the SAW Method (Case Study of PPKH Kab.Tasikmalaya)," Indonesia. J. Softw. eng., vol. 5, no. 2, 2019, doi:10.31294/ijse.v5i2.7154.
[12.] AA Azhari, Y. Nyura, and A. Najib, "Comparison of the SAW and TOPSIS Methods on the Admission of Field Work Practice Students," Semin. Nas. Computer Science. and Technol. inf. 2018, vol. 3, no. 1, 2018.
[13.] D. Puspitasari, "DESIGN AND DEVELOPMENT OF WEB-BASED EMPLOYEESAVE-LOAN COOPERATIVE INFORMATION SYSTEM," J. Pillar Nusa Mandiri, vol. XI, no. 2, 2016.
[14.] SN Rochmawati and F. Marisa, "Web-Based Home Recommendation System Using SAW Method at PT.Inproperty," JOINTECS (Journal Inf. Technol. Comput.Sci., vol. 3, no. 2, 2018, doi:10.31328/jointecs.v3i2.808.
[15.] R. Fauzan, Y. Indrasary, and N. Muthia, "Decision Support System for Bidik Misi Scholarship Admission at POLIBAN with Web-Based SAW Method," J. Online Information., vol. 2, no. 2, 2018, doi:10.15575/join.v2i2.101.
[16.] R. Setiawati, "ZIS (ZAKAT, INFAK, SEDAKAH) MANAGEMENT IN THE DEVELOPMENT AND DEVELOPMENT OF THE POTENTIAL OF ORPHANS AT THE MANDIRI ORIGINAL FOUNDATION, LAMPUNG," COMMUNICATION, vol. 1, no. 2, 2019, doi:10.24042/komunika.v1i2.4747.
[17.] Iswatul Hasanah, EMPOWERMENT OF ORPHANS THROUGH THE GOAT COMPENSATION PROGRAM BY THE AL FALAH SIDOARJO SOCIAL FUND FOUNDATION, vol. 11, no. 1. 2019.