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# Decision Support System for Proposing Scholarship Recipients to Best Students using SAW

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***Abstract***

*Each school has a huge number of students. Many assessments can be done on students. Students come from various backgrounds. Some are rich, and some are poor. In the learning process, these students need money so that the continuity of learning goes well. To encourage students, a scholarship is needed to encourage student learning. Decision support systems can help provide recommendations to schools to provide scholarship assistance to eligible students. Several criteria determine the awarding of the scholarship. The Simple Additive Weighting (SAW) method is an excellent method of ranking students who deserve scholarships. This method works based on the five criteria tested. By applying this method, the school will get information on which students are eligible for scholarships.*

***Keywords:*** *Scholarship, student, SAW, DSS*

## 1. INTRODUCTION

Students are someone who does the learning process in a school. This student will become the next generation of the nation that is useful for the country. Studious students will have a good future or will enter leading universities. However, to realize it all is not easy. Student economic conditions are not all the same. Some have excellent finance, and there are also mediocre. The granting of scholarships is very helpful for the smooth running of education for these students. Scholarships can help the student's parents reduce the child's monthly expenses[1].

In determining the scholarship, there are several requirements. It is not easy for schools to determine or take students to be given scholarships from their schools. What is feared is when the school provides scholarships to students who are not appropriate in terms of the financial and quality of these students. The way is to see the attitudes and behavior of students. This method is a way that is not good and objective because the assessment is only done with the student's daily behavior. Good judgment must have a clear basis of consideration[2], [3].

Decision support systems are an excellent method of determining the best students. The SAW method is one of the decision support system methods that the author did in this study. Several criteria are provided before choosing students who are eligible for scholarships. Each student is assessed based on different grades of attendance, politeness, neatness,

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assignments, and examinations[4], [5]. Determining the best student to be chosen, to get a scholarship requires a proper calculation so that no wrong choice occurs. Decision support systems can help provide recommendations on determining scholarships for the best students. In a decision support system, the results of the assessment depend on the weight of the preferences used as the process of finding the candidate[6].

## 2. THEORIES

### *2.1 School*

School is a significant thing for human life with no school, so the quality of public education is disrupted [7]. The life he lives will also not be guaranteed; there is much unemployment everywhere because the knowledge he has is unable to meet the desired standard. For this reason, education is essential for us as the next generation of the nation. The role of parents is significant as an encouragement for their children to continue to keep the spirit in school education. The role of parents as real educators is temporarily replaced and left entirely to educators who are more professional in terms of their fields. In general, the school is an educational institution that is formal, non-formal, and informal, which is established by the state or private that is designed to teach, educate through the education that has been given by educators. To make a school must have adequate facilities and infrastructure, such as a study room, library, office space, mosque, computer room, or others [8].

School is an institution that is used for learning activities for educators as well as a place to give and receive lessons in accordance with their fields [9]. Schools become one of the places to educate children to provide the knowledge given so that they can become useful humans for the nation and also the country. Schools have a significant role in the life of the nation. The functions of the school that should need to know together, including:

1. Preparing Students for a Job
   For students who have graduated to take their education, it is expected to be able to get even open specific jobs. The higher the level of education, the person is expected to be able to have a better job the job he gets.
2. Provide Basic Skills
   Schools can provide the necessary skills for educators in the form of reading, writing, and also counting. For this reason, these three things are needed in human life because humans will not be separated from it, especially for those who want to get a good job.
3. Providing General Knowledge
   The school will give knowledge that we have never known before, and therefore by tasting education, the knowledge that we can also increase. Therefore do not be tired to continue going to school, because from there life it will be better.

For this reason, schools significantly affect human life in terms of finding work. If someone has a high education, then surely he will get a much better job compared to people who have low education. No wonder so many people keep up their enthusiasm to pursue their education, because science is indeed essential for human life, if someone does not know, then he will also be easy to be lied to or quickly

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colonized by other countries. Young people must continue to be enthusiastic about taking education so that the welfare of the nation and the country becomes secure.

### *2.2 Scholarship*

Scholarship can be interpreted as a form of appreciation given to individuals in order to continue their education to a higher level; the award can be in the form of specific access to an institution or an award in the form of financial assistance.

Academic Achievement Improvement Scholarships are scholarships given to increase or equalize and study opportunities for students who have difficulty paying their education costs as a result of the economic crisis, especially for students with academic achievements. The general objectives of scholarship to increase academic achievement are:

1. Increasing Equality and learning opportunities for students who have difficulty paying tuition fees.
2. Encourage and maintain student enthusiasm for learning so that they can complete their studies or education on time.
3. Encouraging to improve academic achievement toto spur improvement in the quality of education.

The scholarship is income for those who receive the scholarship. The income is an additional economic capability by name and in whatever form that is received or obtained from sources from Indonesia or outside Indonesia that can be used for consumption or to increase the taxpayer's wealth because scholarships can be interpreted to increase economic capacity for the recipient, meaning the scholarship is income [10].

Each school has criteria to determine who will be selected to receive a scholarship. Distribution of scholarships is done by several institutions to help someone less capable or achievers during their studies, while the criteria are attendance, courtesy, neatness, assignments, test scores [11]. The scholarship is the provision of tuition assistance offered to students to uphold education. It is educational assistance to students to support financial problems. Scholarships are financial assistance provided by students with the aim of the educational process undertaken. The purpose of the scholarship is for students from disadvantaged families to continue to higher education. Education is an effort to improve the quality of people's lives for the better because education is a long-term investment to improve quality human resources. The provision of subsidies for education costs aims to reduce the burden on parents of students to obtain an education.

## 3. METHODOLOGY

This research uses Simple Additive Weighting (SAW) for recommending the alternatives. It is one of the decision support system techniques. It works by calculating the weighting of the sum method. The basic concept of the SAW method is to find the number of weighted performance ratings for each alternative on all attributes. The SAW method requires the process of normalization of the decision matrix (X) to a scale proportional to all existing alternative ratings.

Simple Additive Weighting (SAW), also known as a linear weighted combination or valuation method, is the simplest and most frequently used multi-attribute decision technique[12]. This method is based on a weighted average. Evaluation scores are calculated for each alternative by multiplying the scale value given to these alternative attributes by the relative importance weights directly assigned by the decision-maker, followed by adding up the product for all criteria. The advantage of this method is the proportional linear

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transformation of raw data, which means that the relative order of the standard score remains the same. The SAW process uses this following formula.

$$Rij = \begin{cases} \frac{X_{ij}}{Max\ X_{ij}} \\ \frac{Min\ X_{ij}}{X_{ij}} \end{cases}$$

Information:

$R_{ij}$ : Performance changes performance ratings.
$Max_{ij}$ : The maximum value of each row and column.
$Min_{ij}$ : Minimum value for each row and column.
$X_{ij}$ : Row and column matrix.

Rij is a normalized performance rating from alternative Ai

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

$$Vi = \sum_{j=1}^{n} Wjr_{ij}$$

Information:

$V_i$ : The final value of the alternative
$W_j$ : Weight specified
$R_{ij}$ : Normalization matrix

A higher Vi value indicates that the Ai alternative is preferred.

The advantage of the simple additive weighting method compared to other decision-making models lies in its ability to carry out more precise assessments because it is based on predetermined values and weighting preferences.

## 4. RESULT AND DISCUSSION

This chapter is to test the results of a decision support system calculation to determine the best student recipients of scholarships. Testing is done by calculating the SAW value manually. The calculation results obtained must have or show the SAW value so that the calculations do not experience errors. Several steps need to be done in calculating the SAW value, namely providing alternatives, criteria, and weighting preferences. Table 1 is the initial data used.

**Table 1. Initial Data**

| Alternative | Name | Presence | Courtesy | Neatness | Duty | Exam |
|---|---|---|---|---|---|---|
| A1 | Resky | 64 | 57 | 86 | 58 | 93 |
| A2 | Renny | 91 | 53 | 76 | 58 | 71 |
| A3 | Ahmed | 92 | 84 | 62 | 93 | 79 |
| A4 | Rowan | 89 | 88 | 83 | 87 | 71 |
| A5 | Sunny | 63 | 70 | 79 | 67 | 97 |
| A6 | Denish | 75 | 98 | 54 | 92 | 74 |
| A7 | Olive | 78 | 76 | 80 | 63 | 61 |
| A8 | Muhammad Ali | 77 | 53 | 82 | 91 | 65 |
| A9 | Giska | 52 | 92 | 78 | 53 | 90 |
| A10 | Jenny | 89 | 76 | 92 | 89 | 99 |

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Table 1 explains the data used as initial student data. In the data, there are five criteria used to support the SAW process. Each criterion is filled with specific values. This criterion must be normalized to determine the SAW value. Each criterion has its value entered on a scale of 50 to 100. Preferential weights are a balance of strength in choosing specific criteria that are the priority assessment of each criterion. Table 2 shows the preference weights used.

**Table 2. Preferred Weight**

| Criteria | Weight | Normalization | Precentage |
|---|---|---|---|
| C1 | 15 | 0,15 | 15% |
| C2 | 10 | 0,10 | 10% |
| C3 | 10 | 0,10 | 10% |
| C4 | 25 | 0,25 | 25% |
| C5 | 40 | 0,40 | 40% |
| | **100** | **1** | **100%** |

The preference weights function to normalize the criteria weights. Table 3 shows the result of normalization criteria.

**Table 3. Criteria Normalization**

| Alternative | Name | C1 | C2 | C3 | C4 | C5 |
|---|---|---|---|---|---|---|
| A1 | Resky | 0,6957 | 0,5816 | 0,9348 | 0,6237 | 0,9394 |
| A2 | Renny | 0,9891 | 0,5408 | 0,8261 | 0,6237 | 0,7172 |
| A3 | Ahmed | 1,0000 | 0,8571 | 0,6739 | 1,0000 | 0,7980 |
| A4 | Rowan | 0,9674 | 0,8980 | 0,9022 | 0,9355 | 0,7172 |
| A5 | Sunny | 0,6848 | 0,7143 | 0,8587 | 0,7204 | 0,9798 |
| A6 | Denish | 0,8152 | 1,0000 | 0,5870 | 0,9892 | 0,7475 |
| A7 | Olive | 0,8478 | 0,7755 | 0,8696 | 0,6774 | 0,6162 |
| A8 | Muhammad Ali | 0,8370 | 0,5408 | 0,8913 | 0,9785 | 0,6566 |
| A9 | Giska | 0,5652 | 0,9388 | 0,8478 | 0,5699 | 0,9091 |
| A10 | Jenny | 0,9674 | 0,7755 | 1,0000 | 0,9570 | 1,0000 |

Table 4 shows the results of calculating vector values for each alternative.

**Table 4. Vector value of each alternative**

| Alternative | Name | C1 | C2 | C3 | C4 | C5 |
|---|---|---|---|---|---|---|
| A1 | Resky | 0,1044 | 0,0582 | 0,0935 | 0,1559 | 0,3758 |
| A2 | Renny | 0,1484 | 0,0541 | 0,0826 | 0,1559 | 0,2869 |
| A3 | Ahmed | 0,1500 | 0,0857 | 0,0674 | 0,2500 | 0,3192 |
| A4 | Rowan | 0,1451 | 0,0898 | 0,0902 | 0,2339 | 0,2869 |
| A5 | Sunny | 0,1027 | 0,0714 | 0,0859 | 0,1801 | 0,3919 |
| A6 | Denish | 0,1223 | 0,1000 | 0,0587 | 0,2473 | 0,2990 |
| A7 | Olive | 0,1272 | 0,0776 | 0,0870 | 0,1694 | 0,2465 |
| A8 | Muhammad Ali | 0,1256 | 0,0541 | 0,0891 | 0,2446 | 0,2626 |
| A9 | Giska | 0,0848 | 0,0939 | 0,0848 | 0,1425 | 0,3636 |
| A10 | Jenny | 0,1451 | 0,0776 | 0,1000 | 0,2393 | 0,4000 |

Table 5 shows the results of calculating the SAW value for each alternative.

**Table 5. Recommended best students**

| Alternative | Name | SAW |
|---|---|---|
| A1 | Resky | 0,7878 |
| A2 | Renny | 0,7279 |
| A3 | Ahmed | 0,8723 |
| A4 | Rowan | 0,8459 |
| A5 | Sunny | 0,8320 |
| A6 | Denish | 0,8273 |
| A7 | Olive | 0,7077 |
| A8 | Muhammad Ali | 0,7760 |
| A9 | Giska | 0,7696 |
| A10 | Jenny | 0,9620 |

## 5. CONCLUSION

After conducting a discussion about the SAW method in determining the best students, there are some conclusions that the authors describe based on the results of testing that has been done. The SAW method succeeded in ranking and determining the best students who would be entitled to a scholarship. Preference weights are parameters that function to regulate variations in the ranking of SAW values. The resulting SAW value has accuracy based on manual calculations from the given alternative data.

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