IMPLEMENTATION OF SIMPLE ADDITIVE WEIGHTING METHOD AS A DECISION SUPPORT FOR NEW STUDENT ADMISSION IN MADRASAH ALIYAH

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Abstract

The selection or acceptance of new students is something that needs to be determined quickly. In terms of the determination of prospective new students, several considerations are needed which are quite numerous and complicated, namely, the standard of grades, school entry requirements, and policies of the government and educational institutions that often change each year. In terms of the admission of new students, students are required to come directly. During this time the process of admission test for new students is still using the manual method by filling out the answer sheet provided by the committee. The method used in determining students to be accepted is Simple Additive Weight. From determining the admission of new students using the Simple Additive Weight method, where this method provides certain criteria which have a weight value of each so that the results of the sum of the weights will get the final decision and rank the students accepted at Madrasah Aliyah named Amira and Afrilina.

Keywords: Simple Additive Weighting, Decision Support, Admission of New Students

INTRODUCTION

The limited number of students who can be accommodated in this school causes the school to carry out the selection process of prospective students who have registered (Dzulhaq et al., 2017). Registration still uses the form, and can only be obtained by coming to school (Irfiani & Encep, 2017). And felt less concise, because there are 2 times the work in the system. And felt less concise, because there are 2 times the work in the system. Then if the registration (3 days) is felt in the middle of the quota registration period is full then the registration is closed (Pratama & Yustanti, 2016). Prospective students who register each year are increasing and always exceeding the available quota, sometimes the admissions committee has difficulty in selecting and selecting prospective students to be accepted (Sopyan et al., 2016). Admission of new students only uses written tests so along with the changing times also to improve the quality of good students a written test is needed to determine the non-academic achievements of prospective new students (Aulia & Oktafianto, 2014). The SAW method for the calculation process can solve the selection problem, the calculation process from several choices, and the benchmarks that become the
determination. The load process for each benchmark outlines the benefit factor for the algorithm SAW (Sunarti, 2020). During this time the process of admitting new students is still using the manual method by filling in the answer sheet provided by the committee. Some of the criteria are seen from passing the standard values determined by Madrasah Aliyah Darunnajah, passing the Imla written test, report cards, reading oral Al-Qur’an test, and also non-academic achievement, which is the last interview or interview conducted. At Madrasah Aliyah Darunnajah, the student admission process is still not deemed appropriate enough. This caused the new student admission committee to not be able to manage everything properly and felt inconvenienced because too many registered. So it is felt to be less than optimal and requires considerable time, both in preparing reports and deciding prospective new students to be accepted even though ideally the selection of prospective students must be determined as soon as possible to support the others.

Because of the need for decision support that can help to determine students who will be accepted at Madrasah Aliyah Darunnajah. The results given by this decision support are able to provide an alternative problem solving (Frieyadie, 2017) existing so that decisions made for the better. The method used in determining students to be accepted is Simple Additive Weighting (SAW) (Widiati & Putri, 2018). Where this method is a weighted numbering method or a method that provides certain criteria that have a weight value of each so that the sum of the weights will get the results that become the final decision. The aim is to produce fast, permanent, and accurate information about students who will be accepted by Madrasah Aliyah Darunnajah.

RESEARCH METHODS

Types of research
This research study will be about the decision support that can help to determine students who will be accepted.

Time and Place of Research
The study was conducted during the process of student admission to Madrasah Aliyah in Darunnajah.

Research subject
In this study, researchers used non-probability sampling techniques by taking samples using purposive sampling. The population accepted at Madrasah Aliyah Darunnajah was 400 students, and the sample taken was 7 students. The Simple Additive Weight (SAW) method is a multi-criteria decision-making method. By calculating quantitatively with Simple Additive Weight (SAW). Where this study is an alternative to student acceptance at Madrasah Aliyah namely K1 = Andini, K2 = Azis, K3 = Dessy, K4 = Diamond, K5 = Amira, K6 = Daffa, K7 = Afrilina.

Data, Instrument, and Data Collection Techniques
The author uses a suitable list technique (checklist) is a list that contains the subject and aspects to be observed. A checklist can guarantee that the researcher records every event that is considered important. Aspects noted in this case the decisive criteria for student acceptance at Madrasah Aliyah are (Imla written test, report card grades, oral reading al-Qur’an, non-academic achievement, and interviews

All prospective students in and outside the Jakarta area are required to come directly to take the test to Madrasah Aliyah Darunnajah, the new admissions committee cannot manage everything properly and feel inconvenienced because too many students register using the Simple Additive Weighting (SAW) method in determining the prospective Madarasah Aliyah students accepted at Darunnajah. It can help the committee in the process of accepting new students. Conduct research of each criterion for the acceptance of new students. Using the Simple Additive Weighting (SAW) method in determining the admission of new students.

RESEARCH RESULTS AND DISCUSSION

In the hierarchy of new student admission decisions there is a relationship between goals, criteria, and alternatives. The relationship can be described as follows:

Figure 1. Alternative Hierarchical Structure Determination of New Student Acceptance
Determination of Criteria for the Simple Additive Weight (SAW) Method

Determination of the criteria in the Simple Additive Weight (SAW) method there are criteria needed to determine the admission of new students, namely:

Table 1. Criteria for admission of new students

| No | Code | Description                        |
|----|------|------------------------------------|
| 1  | C1   | Imla Written Test                  |
| 2  | C2   | Report Card Value                  |
| 3  | C3   | Oral Reading Test Al-Qur’an        |
| 4  | C4   | Non-Academic Achievement           |
| 5  | C5   | Interview                          |

From table 1 these criteria, a level of importance is made based on the specified weight and scale values and compared to the weighting table as follows:

a. Imla Written Test

In the Imla Written Test criteria ‘where the more obvious and correct Arabic writing, the better the value obtained. Here is the table 2:

Table 2. Imla Written Test Assessment

| Criteria      | Range    | Scale | Weight |
|---------------|----------|-------|--------|
| Very low      | 0-40     | 1     | 0.2    |
| Low           | 50-55    | 2     | 0.4    |
| Enough        | 60-70    | 3     | 0.6    |
| High          | 75-80    | 4     | 0.8    |
| Very high     | 85-100   | 5     | 1      |

b. Report Card Value

Report Card Value is a requirement needed to make decisions the better the report card value, the greater the value obtained. Here is the table 3:

Table 3. Report cards report cards

| Criteria | Range | Scale | Weight |
|----------|-------|-------|--------|
| Very low | 0-40  | 1     | 0.2    |
| Low      | 50-55 | 2     | 0.4    |
| Enough   | 60-70 | 3     | 0.6    |
| High     | 75-80 | 4     | 0.8    |
| Very high| 85-100| 5     | 1      |

c. Oral Reading Test Al-Qur’an

The oral test of reading the Qur’an is a requirement that is needed to make a decision, the smoother the reading of the Qur’an is and the clearer the letter makhraj, the higher the value obtained. Here is the table 4:

Table 4. Oral Reading Test Al-Qur’an

| Criteria      | Range   | Scale | Weight |
|---------------|---------|-------|--------|
| Very low      | 0-40    | 1     | 0.2    |
| Low           | 50-55   | 2     | 0.4    |
| Enough        | 60-70   | 3     | 0.6    |
| High          | 75-80   | 4     | 0.8    |
| Very high     | 85-100  | 5     | 1      |

d. Non-Academic Achievement

Non-Academic Achievement is a supporting achievement and includes the requirements needed to make decisions. Here is the table:

Table 5. Non-Academic Achievement

| Criteria      | Range   | Scale | Weight |
|---------------|---------|-------|--------|
| Very low      | 0-40    | 1     | 0.2    |
| Low           | 50-55   | 2     | 0.4    |
| Enough        | 60-70   | 3     | 0.6    |
| High          | 75-80   | 4     | 0.8    |
| Very high     | 85-100  | 5     | 1      |

e. Interview

In the interview criteria, where the better the interview, the greater the value obtained. Here is the table 6:

Table 6. Interview Test

| Criteria | Range | Scale | Weight |
|----------|-------|-------|--------|
| Very low | 0-40  | 1     | 0.2    |
| Low      | 50-55 | 2     | 0.4    |
| Enough   | 60-70 | 3     | 0.6    |
| High     | 75-80 | 4     | 0.8    |
| Very high| 85-100| 5     | 1      |

Determined based on the main requirements or criteria above, then the preference weights (W) are as follows:

1. W1 = Imla Test Written ’(30%) = 0.3
2. W2 = Report Card Value (20%) = 0.2
3. W3 = Oral Reading Test Qur’an (20%) = 0.2
4. W4 = Non Academic Achievement (15%) = 0.15
5. W5 = Interview (15%) = 0.15

In determining the acceptance of new students by the Simple Additive Weight (SAW) method based on the above criteria, Table 7 the following data are obtained, seen in Table 7:

Table 7. Value of each criterion

| No | Name   | Imla’ | TBQ | PN | Interview |
|----|--------|-------|-----|----|-----------|
| 1  | Andini | 85    | 75  | 80 | 80        | 85        |
| 2  | Azis   | 75    | 85  | 70 | 70        | 80        |
| 3  | Dessy  | 60    | 65  | 50 | 80        | 80        |
| 4  | Intan  | 50    | 70  | 40 | 60        | 70        |
| 5  | Amira  | 90    | 95  | 85 | 80        | 90        |
| 6  | Daffa  | 60    | 70  | 55 | 65        | 60        |
| 7  | Afrilna| 95    | 90  | 80 | 70        | 90        |
Make a Decision Matrix Based on Criteria (Ci)

The values from the results of the match table are then made into a matrix as follows:

\[
X = \begin{pmatrix}
1 & 0.8 & 0.8 & 0.8 & 1 \\
0.8 & 1 & 0.6 & 0.6 & 0.8 \\
0.6 & 0.6 & 0.4 & 0.8 & 0.8 \\
0.4 & 0.6 & 0.2 & 0.6 & 0.6 \\
1 & 1 & 1 & 0.8 & 1 \\
0.6 & 0.6 & 0.4 & 0.6 & 0.6 \\
1 & 1 & 0.8 & 0.6 & 1
\end{pmatrix}
\]

Matrix Normalization

Make a Normalized Matrix based on an equation that is adjusted to the type of attribute (profit attribute or ordinary attribute) so that the normalized matrix R. See table 8 below.

| Criteria                                      | Benefit | Cost          |
|-----------------------------------------------|---------|---------------|
| Imla Written Test '                           | √       |               |
| Report Card Value                             | √       |               |
| Oral Reading Test Al-Qur'an                   | √       |               |
| Non-Academic Achievement                      |         |               |
| Interview                                     |         |               |

Determine R using the following formula:

\[
rij = \begin{cases}
\frac{x_{ij}}{\text{Max } x_{ij}} & \text{if } j \text{ is the profit attribute (benefit)} \\
\frac{1}{\text{Min } x_{ij}} & \text{if } j \text{ is the profit attribute (cost)} \\
\end{cases} \quad (1)
\]

Information:

Max \( x_{ij} \) = The biggest value of each criterion i.
Min \( x_{ij} \) = The smallest value of each criterion i.
\( x_{ij} \) = attribute value owned by each criterion

1. For Imla Written Test Criteria '

R11, R51, dan R71=1
R21=0.8
R31, R61 = 0.6
R41=0.4

So for R11, R51, R71 has a value of 1 for R21 has a value of 0.8 then for R31, R61 has a value of 0.6 and for R41 has a value of 0.42.

2. For Report Card Value Criteria

R12=0.8
R22, R52, dan R72=1
R32, R42, dan R62=0.6
So for R12 has a value of 0.8 for R22, R52, and R72 has a value of 1 then for R32, R42, and R62 has a value of 0.6.

3. For Oral Reading Test Al-Qur'an Criteria

R13, dan R73= 0.8
R23=0.6
R33 dan R63 =0.4
R43=0.2
R53 =1
Then for R13, and R73, has a value of 0.8 for R23 has a value of 0.6 then for R33, and R63 has a value of 0.4 and for R43 have a value of 0.2 and for R53 = 1

4. For Non-Academic Achievement Criteria

R14, R34 dan R54 =0.75
R24, R44, R64 dan R74=1
So for R14, R34 and R54 have a value of 0.75 and R24, R44, R64, and R74 have a value of 1.

5. For Interview Criteria

R15, R55, dan R75=0.6
R25, dan R35=0.75
R45, dan R65 =1
Then for R15, R55, and R75 has a value of 0.6 and for R25, and R35 has a value of 0.75 and for R45, and R65 has a value of 1.

From the above calculation, the R matrix is obtained as follows:

\[
R= \begin{pmatrix}
1 & 0.8 & 0.8 & 0.75 & 0.6 \\
0.8 & 1 & 0.6 & 1 & 0.75 \\
0.6 & 0.6 & 0.4 & 0.75 & 0.75 \\
0.4 & 0.6 & 0.2 & 1 & 1 \\
1 & 1 & 1 & 0.75 & 0.6 \\
0.6 & 0.6 & 0.4 & 1 & 1 \\
1 & 1 & 0.8 & 1 & 0.6
\end{pmatrix}
\]

Determination of the Match Rating of Each Alternative With Every Criteria

In determining the suitability rating then each criterion is entered into a match rating table that has been adjusted to the value of the criteria table. Then the match rating table 9 can be seen as follows:
Table 9. Match Ratings

| No | Name  | Criteria | TM | TBQ | PN | Interview |
|----|-------|----------|----|-----|----|-----------|
| 1  | Andini | 1 | 0.8 | 0.8 | 0.8 | 1         |
| 2  | Azis   | 0.8 | 1   | 0.6 | 0.6 | 0.8       |
| 3  | Dessy  | 0.6 | 0.6 | 0.4 | 0.8 | 0.8       |
| 4  | Intan  | 0.4 | 0.6 | 0.2 | 0.6 | 0.6       |
| 5  | Amira  | 1   | 1   | 1   | 0.8 | 1         |
| 6  | Daffa  | 0.6 | 0.6 | 0.4 | 0.6 | 0.6       |
| 7  | Afrilina | 1   | 1   | 0.8 | 0.6 | 1         |

Define Ranking
To find the value of each student revealed passing the new student admission test, determine rank by using the following formula:

\[ V_i = \sum_{j=1}^{n} w_j \cdot r_{ij} \]  

Information:
Vi = ranking for each alternative
Wj = the weight value of each criterion
rij = normalized performance rating value

Determining the value of V1 up to V7 is as follows:

\[ V1 = 0.82 \]
\[ V2 = 0.82 \]
\[ V3 = 0.60 \]
\[ V4 = 0.44 \]
\[ V5 = 0.91 \]
\[ V6 = 0.54 \]
\[ V7 = 0.90 \]

From the results of the calculation of Vi of each student who will be accepted then the ranking determination table 10 can be made as follows:

Table 10 Final Values

| No | Name  | Criteria | TM | TBQ | PN | Interview | Result | Percentage (%) |
|----|-------|----------|----|-----|----|-----------|--------|----------------|
| 1  | Amira | 0.3 | 0.2 | 0.2 | 0.11 | 0.09 | 0.91 | 91 |
| 2  | Afrilina | 0.3 | 0.2 | 0.16 | 0.15 | 0.09 | 0.90 | 90 |
| 3  | Andini | 0.3 | 0.16 | 0.16 | 0.11 | 0.09 | 0.82 | 82 |
| 4  | Azis | 0.24 | 0.2 | 0.12 | 0.15 | 0.11 | 0.82 | 82 |
| 5  | Daffa | 0.18 | 0.12 | 0.08 | 0.15 | 0.15 | 0.68 | 68 |
| 6  | Dessy | 0.18 | 0.12 | 0.08 | 0.11 | 0.11 | 0.54 | 54 |
| 7  | Intan | 0.12 | 0.12 | 0.04 | 0.15 | 0.15 | 0.44 | 44 |

From the determination of the acceptance of new students using the Simple Additive Weight (SAW) method, the highest value for students accepted at Madrasah Aliyah Darunnajah is Amira with a percentage of 91% and Afrilina with a percentage of 90%. Next below Figure 2 Graphic Final Value Determination of New Student Acceptance.

CONCLUSIONS AND SUGGESTIONS

Conclusion
From the determination of admission of new students using the Simple Additive Weight (SAW) method, then based on ranking, the highest value can be obtained with the percentage for students who are accepted at the Aliyah Darunnajah Madrasah named Amira with a percentage of 91% and Afrilina with a percentage of 90%.

Suggestion
It is expected that the next research will add criteria for determining student acceptance by adding criteria and alternatives and using other methods such as profile matching, AHP, weighted product, electre.
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