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Decision Support System for Priority Improvement of School Rooms at SD Negeri 020254 Binjai City to Obtain Special Allocation Fund (DAK) Assistance Using the MOORA Method

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Abstract

The school room in the school building has an important function for the development and growth of education at SD Negeri 020254 Binjai City in realizing quality improvement and human resource development. The government through the Ministry of Education and Culture (Kemendikbud) provides a Special Allocation Fund (DAK). The DAK assistance provided by the Government aims to ensure that schools can improve school facilities and infrastructure for teaching and learning activities in schools to run optimally. The problem faced by the elementary school is to choose and determine the space in the school building that is prioritized for repair because it is not possible to renovate the school as a whole. The Moora Method Decision Support System (SPK) can help elementary schools in helping to solve these problems. From the results of the calculations carried out, the results with the highest score were obtained, namely the student bathroom room with a value of 0.3181. Thus the student's bathroom space is prioritized for repairs.

Keywords: DAK, MOORA, SPK

INTRODUCTION

The school room in the school building has a very important function for the development and growth of education at SD Negeri 020254 Binjai City in an effort to realize quality improvement and human resource development, where the space in the school building building is used as educational infrastructure . Therefore, the space in this school building needs to get serious attention in terms of maintenance and maintenance, especially at SD Negeri 020254 Kota binjai. This is because some of the space facilities and infrastructure in the school building are inadequate, causing a sense of discomfort.

The government through the Ministry of Education and Culture (Kemendikbud) provides a Special Allocation Fund (DAK). The DAK assistance provided by the Government aims to make teaching and learning activities in schools run optimally, the importance of schools improving facilities and infrastructure such as renovating classrooms, developing libraries and others.

The problem faced by SD Negeri 020254 Kota Binjai is currently choosing and determining the space in the school building that is prioritized for repair because it is not possible to renovate the school as a whole. Based on this presentation, a Decision Support System (SPK) is needed that can help the public elementary schools 020254 binjai city in helping to solve these problems.

The interim result expected from writing this thesis is a decision support system application that can help the State Elementary School 020254 Binjai City in determining the priority for school room improvement by calculating using the MOORA method and several criteria that are aspects of the assessment to determine the priority for improving schoolrooms. From the calculation results, the value from the highest to the lowest will be obtained. The highest score will be chosen as an alternative that will be chosen as a priority for improving school rooms and is expected to be a consideration for SD Negeri 020254 Kota Binjai in determining the priority for improving school rooms

RESEARCH METHODS

This research method is carried out to systematically search for information or data using scientific methods and applicable sources. In the process of this study, it was shown to provide more meaningful results for related parties in the priority of improving the school space of SD Negeri 020254 Binjai City to get Special Allocation Fund (DAK) assistance so that it can provide better results. The subject of the study was a priority support system for improving the schoolroom of SD Negeri 020254 Binjai City to obtain Special Allocation Fund (DAK) assistance using the MOORA method. Based on the research method used, a flow of activities was created as figure 1 below.

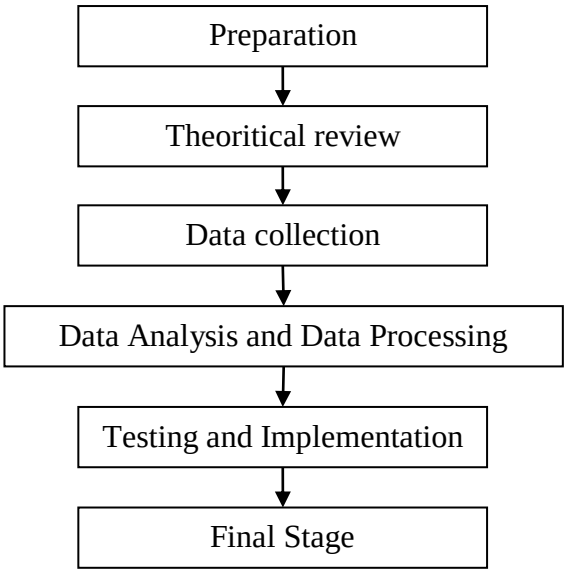

Figure 1 Research Methods

Based on Figure 1, it can be explained the stages used in making a priority support system application program for improving school rooms at SD Negeri 020254 Kota Binjai to get Special Allocation Fund (DAK) assistance using the MOORA method, namely as follows:

1. Preparation

This stage is an initial activity, namely by determining the background of the problem then formulating the problem, then given the limitations of the problem that will be focused on in the preparation of this research and determining the objectives and benefits of the research implementation.

2. Theoretical Studies

At this stage, a theoretical study of the existing problems will be carried out. Studies were conducted to determine the concepts used in the study.

3. Data Collection

This stage is intended to collect supporting data obtained from experts, books, documents, and reports on research reports at SD Negeri 020254 Binjai City.

4. Data Analysis and Data Processing

In this tahp, analysis and processing of supporting data that have been obtained at the previous stage will be carried out.

5. Testing and Implementation

At this stage, data variable testing and data implementation and system program preparation will be carried out. This stage is based on the results of data analysis carried out previously.

6. Final Stage

In the final stage of designing this decision support system, it will be discussed regarding the conclusions and suggestions needed for the further development of the program

Decision Support System

According to Alter (Kusrini, 2007, p. 15) Decision Support System (SPK) or Decision Support System (DSS) is an interactive information system that provides information, modeling, and data manipulation used to aid decision making in structured situations and unstructured situations, where no one knows exactly how decisions should be made. SPK is aimed at supporting management in carrying out work of an analytical nature in less structured situations.

MOORA Method

According to Ubed, et al (2021) The MOORA method was initially introduced by Brauers (2004) is a multiobjective optimization technique that can be successfully applied to solve various types of complex decision-making problems in a manufacturing environment. This method has a good degree of selectiveness because it can determine the goals of the opposite criteria. Where the criteria can be beneficial (benefit) or unprofitable (cost). The following are the steps to complete the MOORA method, which are as follows:

1. Create a criteria value
2. Create a decision matrix
3. Normalizing the MOORA method. This normalization is carried out aimed at uniting matrix elements so that the elements in the matrix have uniform values. Normalization on the matrix is calculated using the following equation:

   $$x_{ij} = \frac{x_{ij}}{\sum_{j=1}^{m} x^2{}_{ij}} \quad \text{.....(1)}$$

4. Optimize attributes. For multi-objective optimization, this normal value is added in terms of maximizing (to benefit attributes) and subtracted in case of minimization (for unfavorable attributes). Then the optimization problem becomes:

   $$y_i = \sum_{j=1}^{g} X_{ij} - \sum_{j=g+1}^{n} X_{ij} \quad \text{.....(2)}$$

5. Subtract the max value and min value to indicate that a more important attribute can be multiplied by the corresponding weight. Currently the attributes are considered calculations with the following equation :

   $$y_i = \sum_{j=1}^{g} W_j X_{ij} - \sum_{j=g+1}^{n} W_j X_{ij} \quad \text{.....(3)}$$

Determine the ranking on the MOORA value.

RESULTS AND DISCUSSION

Discussion of the MOORA Method

The process carried out in the Multi Objective Optimization On The Basic Of Ratio Analysis (MOORA) method requires criteria and weights of each criterion that affect each alternative in the application of the MOORA method. Criterion (C) can be seen in table 1 below:

Table 1. Criteria

No.	Kriteria	Bobot
C1	Foundation	0,20
C2	Structure	0,17
C3	Roof	0,17
C4	Ceiling	0,15
C5	Wall	0,15
C6	Floor	0,08
C7	Utilities	0,08

The above criteria have values that will help in determining the match rating data between the alternative and the criteria based on the degree of damage. The following can be seen in below:

Table 2 Damage Rate Value

Damage Rate	Score	Information
≤ 30 %	1	Light Damage
30% - 45%	2	MediumDamage
≥ 45%	3	Heavy Damage

The following is a sample data for the assessment of building damage at SD Negeri 020254 Binjai City which will be used as an alternative to the calculation of the MOORA method, namely as follows:

Table 3 sample data of building damage assessment at SD Negeri 020254 Binjai City

No	School Room	Building Position	Damage Rate (%)						
			Foundation	Structure	Roof	Ceiling	Wall	Floor	Utilities
1	Student Bathroom 1	Building 5	5%	0%	2%	2%	31%	10%	0%
2	Student Bathroom 2	Building 5	5%	0%	2%	2%	31%	10%	0%
3	3 Student Bathroom	Building 5	5%	0%	2%	2%	31%	10%	0%
4	4 Student Bathroom	Building 5	5%	0%	2%	2%	31%	10%	0%
5	Classroom 4A	Building 1	0%	0%	2%	12%	30%	0%	0%
6	Classroom 4B	Building 1	0%	0%	2%	12%	30%	0%	0%
7	Library	Building 6	0%	0%	0%	0%	27%	0%	0%
8	Classroom 3B	Building 4	0%	0%	0%	5%	10%	2%	0%
9	Teacher's room	Building 4	0%	2%	0%	0%	4%	2%	5%

10	Classroom 1A	Building 3	0%	0%	0%	2%	0%	10%	0%

Furthermore, it conducts a match rating between alternatives and criteria, which are as follows:

Table 4 Data on Matching Ratings Between Alternatives and Criteria

Alternative	C1	C2	C3	C4	C5	C6	C7
A1	1	0	1	1	2	1	0
A2	1	0	1	1	2	1	0
A3	1	0	1	1	2	1	0
A4	1	0	1	1	2	1	0
A5	0	0	1	1	1	0	0
A6	0	0	1	1	1	0	0
A7	0	0	0	0	1	0	0
A8	0	0	0	1	1	1	0
A9	0	1	0	0	1	1	1
A10	0	0	0	1	0	1	0

Here are the steps from solving the MOORA method:
Step 1 : Create a decision matrix X

$$x = \begin{bmatrix} 1 & 0 & 1 & 1 & 2 & 1 & 0 \\ 1 & 0 & 1 & 1 & 2 & 1 & 0 \\ 1 & 0 & 1 & 1 & 2 & 1 & 0 \\ 1 & 0 & 1 & 1 & 2 & 1 & 0 \\ 0 & 0 & 1 & 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 0 & 1 & 0 \end{bmatrix}$$

Step 2 : Normalizing the X matrix

$$C_1 = \sqrt{1^2 + 1^2 + 1^2 + 1^2 + 0^2 + 0^2 + 0^2 + 0^2 + 0^2 + 0^2}$$

$$= \sqrt{4} = 2$$

$$A_{1.1} = \frac{1}{2} = 0{,}50$$

$$A_{2.1} = \frac{1}{2} = 0{,}50$$

$$A_{3.1} = \frac{1}{2} = 0{,}50$$

$$A_{4.1} = \frac{1}{2} = 0{,}50$$

$$A_{5.1} = \frac{0}{2} = 0$$

$$A_{6.1} = \frac{0}{2} = 0$$

$$A_{7.1} = \frac{0}{2} = 0$$

$$A_{8.1} = \frac{0}{2} = 0$$

$$A_{9.1} = \frac{0}{2} = 0$$

$$A_{10.1} = \frac{0}{2} = 0$$

The result of the Normalization matrix X obtained matrix seen below.

$$x = \begin{bmatrix} 0{,}50 & 0 & 0{,}4082 & 0{,}3536 & 0{,}4364 & 0{,}3780 & 0 \\ 0{,}50 & 0 & 0{,}4082 & 0{,}3536 & 0{,}4364 & 0{,}3780 & 0 \\ 0{,}50 & 0 & 0{,}4082 & 0{,}3536 & 0{,}4364 & 0{,}3780 & 0 \\ 0{,}50 & 0 & 0{,}4082 & 0{,}3536 & 0{,}4364 & 0{,}3780 & 0 \\ 0 & 0 & 0{,}4082 & 0{,}3536 & 0{,}2182 & 0 & 0 \\ 0 & 0 & 0{,}4082 & 0{,}3536 & 0{,}2182 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0{,}2182 & 0 & 0 \\ 0 & 0 & 0 & 0{,}3536 & 0{,}2182 & 0{,}3780 & 0 \\ 0 & 1 & 0 & 0 & 0{,}2182 & 0{,}3780 & 1 \\ 0 & 0 & 0 & 0{,}3536 & 0 & 0{,}3780 & 0 \end{bmatrix}$$

Step 3 next optimizes the attribute by including weights in the normalized search which is as follows:

C_1 weight foundation 0,20

$$A_1 = 0{,}50 \; x \; 0{,}20 = 0{,}10$$

$$A_2 = 0{,}50 \; x \; 0{,}20 = 0{,}10$$

$$A_3 = 0{,}50 \; x \; 0{,}20 = 0{,}10$$

$$A_4 = 0{,}50 \; x \; 0{,}20 = 0{,}10$$

$$A_5 = 0 \; x \; 0{,}20 = 0$$

$$A_6 = 0 \; x \; 0{,}20 = 0$$

$A_7 = 0\ x\ 0{,}20 = 0$

$A_8 = 0\ x\ 0{,}20 = 0$

$A_9 = 0\ x\ 0{,}20 = 0$

$A_{10} = 0\ x\ 0{,}20 = 0$

The results of multiplication with the weight of the criteria, namely:

Table 5 Multiplication results with criterion weights

Alternative	C1	C2	C3	C4	C5	C6	C7
A1	0,10	0	0,0694	0,0530	0,0655	0,0302	0
A2	0,10	0	0,0694	0,0530	0,0655	0,0302	0
A3	0,10	0	0,0694	0,0530	0,0655	0,0302	0
A4	0,10	0	0,0694	0,0530	0,0655	0,0302	0
A5	0	0	0,0694	0,0530	0,0327	0	0
A6	0	0	0,0694	0,0530	0,0327	0	0
A7	0	0	0	0	0,0327	0	0
A8	0	0	0	0,0530	0,0327	0,0302	0
A9	0	0,17	0	0	0,0327	0,0302	0,080
A10	0	0	0	0,0530	0	0,0302	0

Step 4 : Search for Yi values

Table 6 Finding the Yi Value

Alternative	Yi = (C1+C2+C3+C4+C5+C6+C7)
A1	0,3181
A2	0,3181
A3	0,3181
A4	0,3181
A5	0,1552
A6	0,1552
A7	0,0327
A8	0,1160
A9	0,3130
A10	0,0833

From the results above, it can be seen the ranking of each alternative from the calculation of the criteria in the following table.

Table 7 Ranking Results

Alternative	School Room	Building Position	Score	Rank
A1	Student Bathroom 1	Building 5	0,3181	1
A2	Student Bathroom 2	Building 5	0,3181	2
A3	3 Student Bathroom	Building 5	0,3181	3
A4	4 Student Bathroom	Building 5	0,3181	4
A9	Teacher's room	Building 4	0,3130	5
A5	Classroom 4A	Building 1	0,1552	6
A6	Classroom 4B	Building 1	0,1552	7
A8	Classroom 3B	Building 4	0,1160	8
A10	Classroom 1A	Building 3	0,0833	9
A7	Library	Building 6	0,0327	10

Use Case

Use case diagrams are used to describe what the system should be doing. Use Case diagrams provide a way of describing an external view of the system and its interactions with the outside world. The following is a mix of use case diagrams:

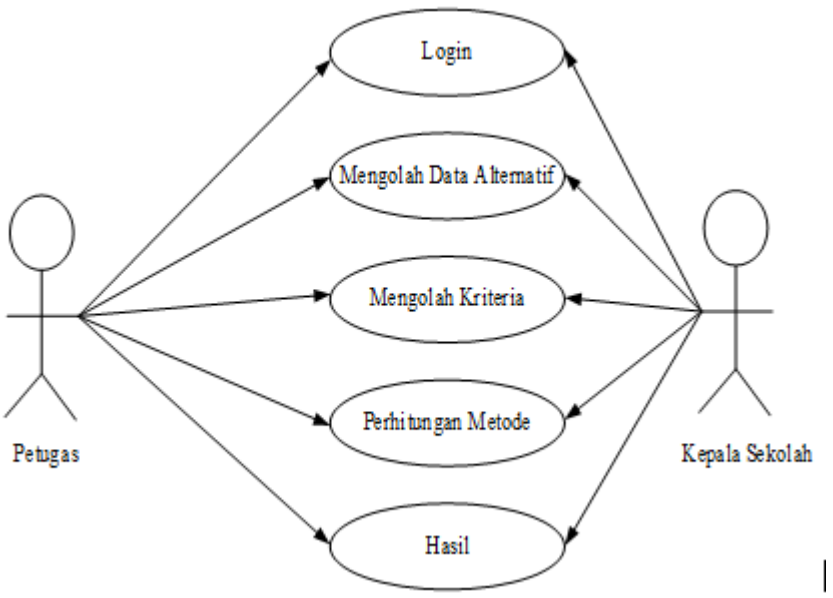

Figure 2 Use Case

The use case diagram above explains the rights owned by the user. In the Use case diagram designed there are two users, namely an officer and a principal. Officers and principals act in all activities in the system, namely logging in, managing alternative data, managing criteria, calculating the MOORA method, and viewing results.

Flowchart

The following is a flowchart from the design of a priority support system for improving the school space of SD Negeri 020254 Kota Binjai to get Special Allocation Fund (DAK) assistance using the MOORA method, which is as follows:

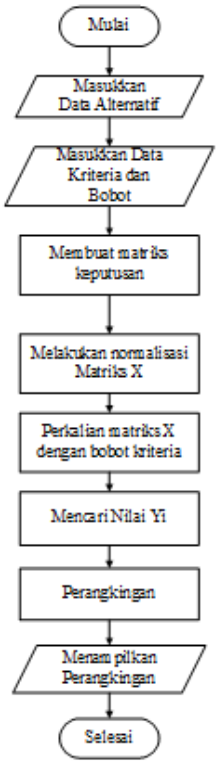

Figure 3 Flowchart

Based on the process flow image, the above can be explained as follows:

1. Get Started
2. Enter alternative data in the form of room data and the building is in the school
3. Enter criteria data as well as weights
4. The process of making a decision matrix based on the data that has been obtained
5. The process of determining the normalization matrix of the decision matrix
6. The process of multiplication of the matrix x with each weight of the criterion
7. The process of searching for Yi values
8. The process of performing the ranking
9. Displaying the results of the ranking
10. Done

CONCLUSION

The following are the conclusions that the researcher wrote in this study related to the Decision Support System for Prioritizing the Improvement of School Rooms at SD Negeri 020254 to Obtain Special Allocation Fund (DAK) Assistance Using the MOORA Method, namely:

1. Based on the calculation results of the MOORA Method, the result obtained is that the alternative A1 of the student's bathroom room is an alternative that has the highest score compared to other alternatives, which means that alternative A1 is the chosen alternative.
2. The MOORA method decision support system can be applied to determine the priority for improving school rooms so that it can be considered for public elementary schools 020254 Binjai City.

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