THE SYSTEM OF DECISION SUPORT FOR DETERMINE OF SCHOLARSHIP RECEIVER AT SMA NEGERI 6 PANDEGLANG

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ABSTRACT

Accordance with regulations prescribed with SMA 6 Pndeglang for obtain the scholarship, so needed some criteria to determine who's the one wich can get it. The scloharship is to do for helping some student which the parents is disable of pay the education, n for some student which achievers.. For helped determine who's some one which reasonable, to get that scolarship, so we needed the system of decision suport. The system of decision suport is with using Fuzzy Multiple Attribute Method (FMADM) and Simple Additive Weighting Method (SAW).

In the development process The System Of Decision Suport to be based on criteria's wich has determined with using Fuzzy Multiple Attribute Method (FMDAM) and Simple Additive Weighting Method (SAW). This method is choosed because can be selecting the best alternative from a some alternative, in this case. The alternative is who's the student reasonable get the scholarship, be based on determined criteria's. The research done with looking for wieght value every attribute, and then done a ranking process which will of optimal alternative determine ,that is to say the best student..

Be based on experiment,, the system can be helping of selectors team work for doing a selecting a scholarship, and then can be more fast of scholarship selecting, and then which can subtract from a mistake in determine a scholarship recipients, and then can be a more easily selector team work for determine a scholarship recipients.

Key Word : *FMDAM, SAW, Criteria*

1. INTRODUCTION

1.1 Identification of Problems

How to build a decision support system using the method of Fuzzy Multiple Attribute Decision Making (FMADM) with Simple Additive weighting method (SAW) to determine the scholarship recipients at SMA Negeri 6 Pandeglang.

1.2 Literature Review

Research object being studied is the High School, which is located at SMA Negeri 6 Pandeglang.

1.3 Purposes and Objectives

The purpose of this final task is to implement a decision support system using the method of Fuzzy Multiple Attribute Decision Making (FMADM) with Simple Additive weighting method (SAW) to determine the scholarship recipients at SMA Negeri 6 Pandeglang.

While objectives to be achieved in this research are:

1. *To facilitate the schools in selecting candidates for scholarships.*
2. *To get more accurate results of who will receive scholarships.*
3. *Applying the method of Fuzzy Multiple Attribute Decision Making (FMADM) with Simple Additive weighting method (SAW) to determine the scholarship recipients.*

1.4 Benefit

The benefits of making these applications include:

1. *Can help scholarships selectors teamwork in conducting settlement scholarships.*
2. *Can accelerate the process of selecting scholarship*
3. *Can reduce an errors in determining the scholarship recipients*
4. *Can facilitate the team selectors in determining the scholarship recipients*

2. MODEL, ANALYSIS, DESIGN, AND IMPLEMENTATION

2.1 Model

1. *Data collection phase*
   a. Study Literature.
   b. Observation.
   c. Interview.
2. *Stage of software creation.*
   a. System / Information Engineering
   b. Analisis
   c. Design
   d. Coding
   e. Trial/testing
   f. Maintenance

2.2 Scholarship

Scholarship was the offering of financial assistance given to individuals which aims to be used for the continuity of education taken.

2.3 SPK

Definition of decision support system which an ideal is :

a. *decision support system is a computer-based system with the interface between machines or computers and users*
b. *decision support system Decision Support System is intended to assist decision makers in solving problems in various levels of management and not to replace the human's position as decision makers*
c. *Decision support system capable of providing an alternative solution to the problem of semi-structured or not good for individuals or groups and in a variety of processes and decision-making styles*
d. *Decision Support System using data, databases and analytical decision models*
e. *decision support systems are effective adaptive interactive, easy to use and flexible*
f. *decision support system provides access to a variety of formats and types of data sources*

2.4 FMADM

Fuzzy Multiple Attribute Decision Making (FMADM) is the method used to find the optimal alternative from a number of alternatives with certain criteria. FMADM is the core of determining the weight value for each attribute, then continue with the process that will select ranking alternatives that have been given. Basically, there are 3 approaches to find the value of the attribute weights, the subjective approach, objective approach and integrated approach between subjective and objective. Each approach has strengths and weaknesses. In the subjective approach, the weight value is determined based on the subjectivity of the decision makers, so that some factors in the process can be determined alternative ranking freely. While the objective approach, the weight values are mathematically calculated so ignore subjectivity of decision makers.
There are several methods that can be used to solve the problem FMADM. include:

a. *Simple Additive Weighting Method (SAW)*
b. *Weighted Product (WP)*
c. *ELECTRE*
d. *Technique for Order Preference by Similarity to Ideal Solution (TOPSIS)*
e. *Analytic Hierarchy Process (AHP)*

2.5 SAW Method

Method SAW (Simple Additive weighting) are often also known term weighted sum method. The basic concept is to find methods SAW weighted sum of the rating the performance of each alternative on all attributes. SAW method requires the decision matrix normalization process (X) to a scale that can be compared with all the alternatives rating.

$$r_{ij} = \begin{cases} \dfrac{x_{ij}}{\underset{i}{Max}\, x_{ij}} & \text{If j attribute benefit} \\ \dfrac{\underset{i}{Min}\, x_{ij}}{x_{ij}} & \text{If j attribute cost} \end{cases} \qquad (1)$$

Explanation :

r_{ij} = *normalized performance rating.*
x_{ij} = *owned attribute values of each criterion.*
$\underset{i}{Max}\, x_{ij}$ = *largest value of each criterion.*
$\underset{i}{Min}\, x_{ij}$ = *smallest value of each criterion.*

benefit = if the greatest value is the best.
cost = if the smallest value is best.

where r_{ij} is the normalized performance ratings of Ai alternatives on attributes C_j; i=1,2,...,m dan j=1,2,...,n . Preference value for each alternative (V_i) is given as :

$$V_i = \sum_{j=1}^{n} w_j r_{ij} \qquad (2)$$

Explanation :
V_i *= ranking for each alternative*
w_j *= weight value of each criterion*
r_{ij} *= normalized performance rating*

V_i values greater indicates that the chosen A_i alternative over .

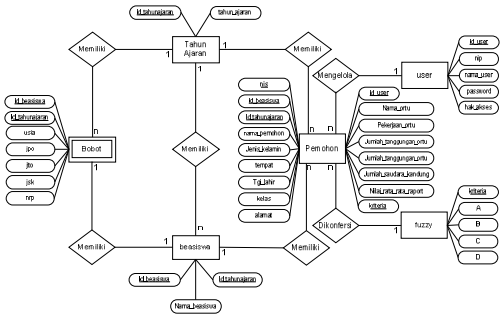
2.6 Step Resolution

The step resolution of FMADM Method and SAW method, included :

1. *gives the value of each alternative (A_i) on each criterion (C_j) specified where values i=1,2,…m and j=1,2,…n.*
2. *weight value (W) who also obtained based on crisp values*
3. *perform normalization matrix by calculating normalized performance rating (r_{ij}) from Ai alternative on C_j attribute, based on the adjusted equation with type attribute (attribute profits or benefits = MAXIMUM or attribute cost = MINIMUM), attribute a profit when the value of the crisp (X_{ij}) attributes of each column divided by the value of crisp MAX (MAX X_{ij}) from each column. whereas for the cost attribute crisp value MIN (MIN X_{ij}) attributes of each column divided by the value of crisp (X_{ij}) every column.*
4. *doing grading for every alternative (V_i) by multiplying the weight value (W_i) with normalized performance rating (r_{ij}).*

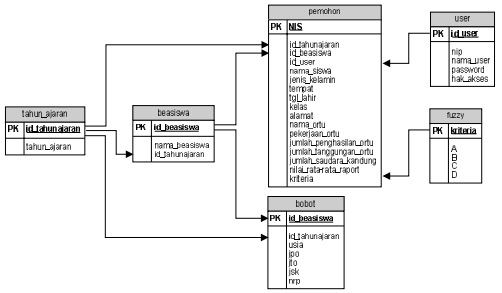
2.7 Desain

1. ERD (Entity Relationship Diagram)



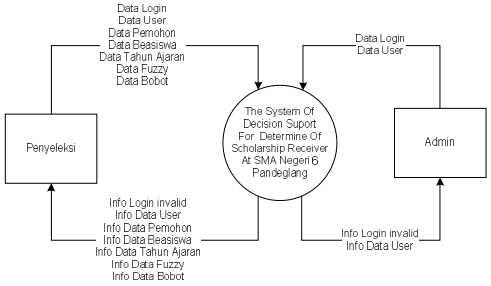
Picture 1. ERD (Entity Relationship Diagram)

2. Relation table



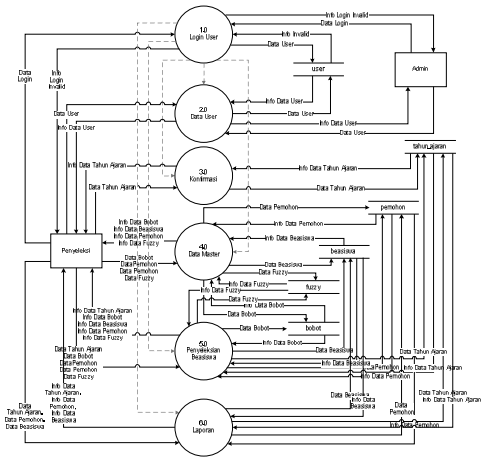
Picture 2. Relation table

3. Context diagram



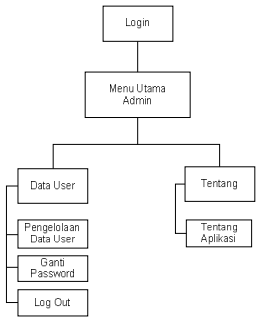
Picture 3. Context diagram

4. DFD (Data Flow Diagram)



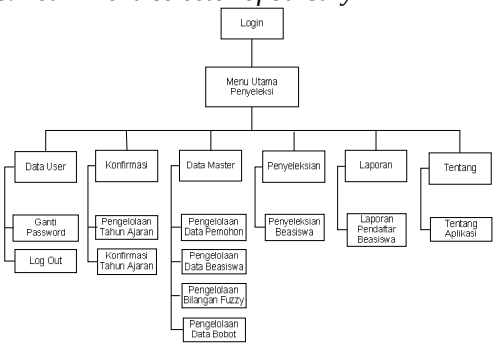
Picture 4. DFD level 1

5. Menu of admin



Picture 5. Menu architecture of admin.

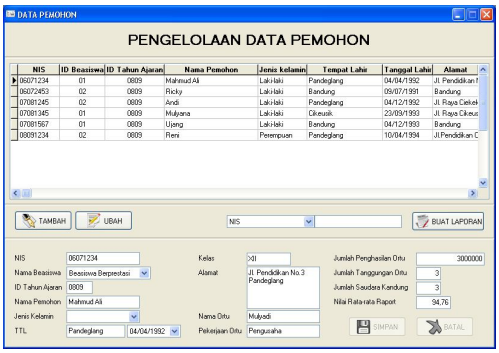
6. Team menu selector of bursary



Picture 6. Menu selector architecture.

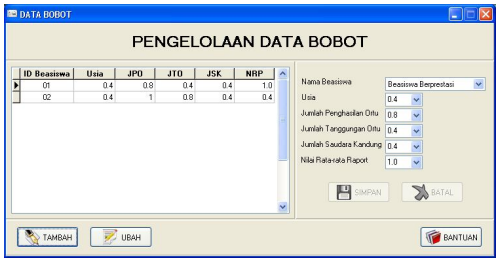
2.8 Implementation

1. Appearance management of applicant data.



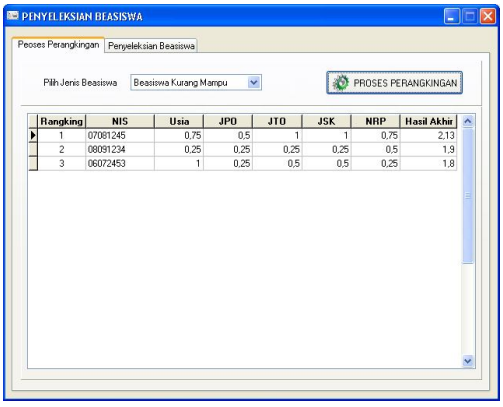
Picture 7. Management of applicant data

2. Appearance management of wight data.



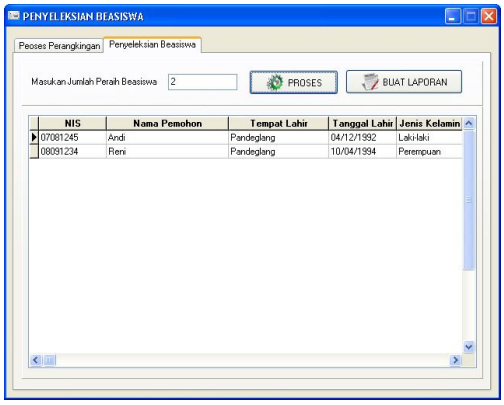
Picture 8. Management of wight data

3. Appearance result of perangkingan.



Picture 9. Result of perangkingan

4. Tampilan hasil penyeleksian



Picture 10. Result of selection

3. RESULTS AND DISCUSSION

3.1 FMADM System Design

In the scholarship selection methods Fuzzy Multiple Attribute Decision Making (FMADM) with Simple Additive weighting methods (SAW) required criteria and weights to perform calculations that will get the best alternative.

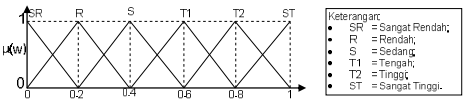
3.2 Criteria and Weighting

In the FMADM method is SAW method required criteria to determine who will be selected as scholarship recipients. The criteria are as follows:

Table 1. Criteria

Criteria	*Boldness*
C_1	*Age*
C_2	*amount of income parents*
C_3	*number of dependent parent*
C_4	*number of siblings*
C_5	*average value of report cards*

From each of these criteria will be determined weights. In the fuzzy weight consists of six digits, a very low (SR), Low (R), moderate, (S), Middle (T1), High (T2), and Very High (ST) as shown in the picture 11.



Picture 11. Number of Fuzzy for wight.

From the picture above, fuzzy numbers can be converted into crisp numbers. To more clearly established weight data in the table below.

Table 2. Weight

Fuzzy Numbers	*Value*
Very Low (VL)	*0*
Low(L)	*0.2*
Moderate (M1)	*0.4*
Middle (M2)	*0.6*
High(H)	*0.8*
Very High (VH)	*1*

3.3 The Example Of Case

Table 3. Applicant of Bursary

No	***Name***	C_1	C_2	C_3	C_4	C_5
1	*Student 1*	*15*	*450.000*	*2*	*2*	*73*
2	*Student 2*	*17*	*1.000.000*	*5*	*5*	*85*
3	*Student 3*	*18*	*400.000*	*3*	*3*	*68*

3.4 Calculation Of The Scholarship Selection

1. Gives the value of each alternative (A_i), on each criterion (C_j) specified.

a. Age (C_1)

Table 4. Age

C_1	*Fuzzy Numbers*	*Value*
C_1 *<= 15 Year*	*Very Young (VY)*	*0.25*
C_1 *= 16 Year*	*Young (Y)*	*0.5*
C_1 *= 17 Year*	*Moderate (M)*	*0.75*
C_1 *>= 18 Year*	*Old (O)*	*1*

b. Amount Of Income Parents (C_2)

Table 5. Amount of income parents

C_2	*Fuzzy Numbers*	*Value*
C_2 *<= Rp. 500.000*	*Low(L)*	*0.25*
C_2 *> Rp. 500.000 – Rp. 1.500.000*	*Enough (E)*	*0.5*
C_2 *> Rp. 1.500.000 – Rp. 3.000.000*	*High(H)*	*0.75*
C_2 *>Rp. 3.000.000*	*Very High (VH)*	*1*

c. Number Of Dependent Parent (C_3)

Table 6. Number of dependent parent

C_3	*Fuzzy Numbers*	*Value*
C_3 *= 1 child*	*Very Little (VL)*	*0*
C_3 *= 2 child*	*Little (L)*	*0.25*
C_3 *= 3 child*	*Moderate (M1)*	*0.5*
C_3 *= 4 child*	*Many (M2)*	*0.75*
C_3 *>=5 child*	*Very Many (VM)*	*1*

d. Number Of Siblings (C_4)

Table 7. Number of siblings

C_4	*Fuzzy Numbers*	*Value*
C_4 *= 1 child*	*Very Little (VL)*	*0*
C_4 *= 2 child*	*Little (L)*	*0.25*
C_4 *= 3 child*	*Moderate (M1)*	*0.5*
C_4 *= 4 child*	*Many (M2)*	*0.75*
C_4 *>=5 child*	*Very Many (VM)*	*1*

e. Average Value Of Report Cards (C_5)

Table 8. Average value of report cards

C_5	*Fuzzy Numbers*	*Value*

C_5 <= 60	Very Low (VL)	0
C_5 = 61 - 70	Low(L)	0.25
C_5 = 71 - 80	Enough (E)	0.5
C_5 = 81 - 90	High(H)	0.75
C_5>= 91	Very High (VH)	1

From the table 8. to change into a X decision matrix with data:

$$X = \begin{bmatrix} 0.25 & 0.25 & 0.25 & 0.25 & 0.5 \\ 0.75 & 0.5 & 1 & 1 & 0.75 \\ 1 & 0.25 & 0.5 & 0.5 & 0.25 \end{bmatrix}$$

2. *Giving weight value (W).*

$W = [\ 0.4 \quad 1 \quad 0.8 \quad 0.4 \quad 0.4\ ]$

3. *Normalize the matrix X into a matrix R with equation (1).*

$$R = \begin{bmatrix} 1 & 1 & 0.25 & 0.25 & 0.5 \\ 0.33 & 0.5 & 1 & 1 & 0.75 \\ 0.25 & 1 & 0.5 & 0.5 & 0.25 \end{bmatrix}$$

4. *Provide ranking process by using equation (2):*

V_1=(0.4)(1)+(1)(1)+(0.8)(0.25)+(0.4)(0.25)+ (0.4)(0.5)
= 0.40 + 1.00 + 0.20 + 0.10 + 0.20
= 1.90
V_2=(0.4)(0.33)+(1)(0.5)+(0.8)(1)+(0.4)(1) +(0.4)(0.75)
= 0.13 + 0.5 + 0.8 + 0.40 + 0.30
= 2.13
V_3= (0.4)(25)+(1)(1)+(0.8)(0.5)+ (0.4)(0.5)+(0.4)(0.25)
= 0.10 + 1.00 + 0.40 + 0.20 + 0.10
= 1.80

Greatest value is in V_2 so alternative A_2 (student to 2) is the alternative selected as the best alternative.

4. CONCLUSIONS AND ADVISING

4.1 Conclusion

1. *The systems that can help build teamwork selectors in the selection of scholarship to scholarship.*
2. *The system that was built to accelerate the process of selecting scholarship.*
3. *The system builders to reduce errors in determining the scholarship recipients.*
4. *The system is built to facilitate the team selectors in determining scholarship recipients.*
5. *Method Fuzzy Multiple Attribute Decision Making (FMADM) with Simple Additive weighting method (SAW) can be applied for the scholarship recipients.*

4.2 Advising

1. *Management of fuzzy numbers is made to be more dynamic.*
2. *Bursary criterion is made to be more dynamic.*
3. *Data being entered into the program are expected to use the correct data.*
4. *Admin expected to continue to perform regular system maintenance.*
5. *remains the preservation of coordination among users in the conduct of selecting scholarship.*

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