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Decision Support Systems Assessment *of the best village in Perbaungan sub-district* with the Simple Additive Weighting (SAW) Method

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ABSTRACT

Information technology is a technology used to process data, including processing, obtaining, compiling storing, manipulating to produce quality information, which is relevant information that is accurate and timely in decision making. In the village assessment is an effort to encourage community efforts based on their own determination and strength as well as researching and assessing the success of community efforts in rural development such as improving the quality of economic, political, social, and cultural life as well as security and order. This research examines how to design an application and build a decision support system to facilitate the process of assessing the best villages. Using the Simple Additive Weighting (SAW) method, assess the best village to be more targeted. The SAW method certainly uses a more accurate assessment because it is based on the value of criteria and weight of predetermined preferences. This research produces a system that can display recommendations for the best village assessment with the results of the criteria that have been determined by the needs of the system.

1. Introduction

In the Village assessment is an afort to encourage community efforts on the basis of their own determination and strength as well as researching and assessing the success of community efforts in rural development such as improving the quality of economic, politic, social, and cultural life as well as security and order. science and technology are very necessary in government agencies, especially in the district office to assess the best village in Perbaungan sub-district. With this computer science and technology can accelerate the performance and accuracy of data in completing a job.

So far what has been done by the Perbaungan District administration in the best village assessment has not been effective, due to the lack of attention, insight, and guidance from the village assessment teams. The best village assessment is very important to do in the Perbaungan sub-district to know the progress of each village

Thus a village assessment decision support system is needed to achieve certain goals or objectives. Decision support systems are usually built to support the solution of a problem or to evaluate an opportunity.

The SAW method is used to make decisions determining the weights of each attribute. The total score for alternative makers is obtained by adding up all of the multiplication results between ratings. (which can be compared across attributes). The SAW method certainly uses a more accurate assessment because it is based on the value of criteria and weight of predetermined preferences. This research

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produces a system that can display recommendations for the best village assessment with the results of the criteria that have been determined by the needs of the system.

2. Teory

2.1 Decision Support System

Decision support systems are usually built to support the solution of a problem or to evaluate an opportunity. Decision support systems are intended to support management in carrying out analytical work in situations that are less structured and with unclear criteria. Thus a village assessment decision support system is needed to achieve certain goals or objectives. Decision support systems are usually built to support the solution of a problem or to evaluate an opportunity.

2.2 Metode Simple Additive Weighting (SAW)

The SAW method is defined as a simple break-in method or weighted sum in problem solving in a decision support system. The concept of this method is to look for a performance rating (scal priority) on each alternative in all attributes.(Dicky Nofrianysah dan Sarjon Defit, 2017:33)

The steps in determining the best village assessment decision by using the Simple Additive Weighting method are as follows :

a) Determine the alternative, namely Ai.
b) Determine the criteria to be used as a reference in making decisions, namely Cj.
c) Give a rating match the value of each alternative on each criterion.
d) Determine the weight of preference or level of importance (W) for each criterion. W = [W1, W2, W3, ..., Wn]
e) Make a match rating table of each alternative on each criterion.
f) Make a decision matrix (X) formed from the match rating table of each alternative to each criterion. The X value of each alternative (Ai) for each predetermined criterion (Cj), where, i = 1, 2, ... m and j = 1,2, ... n.
g) Normalizing the decision matrix by calculating the normalized performance (rij) of Ai alternatives on the Cj criteria
h) The results of the normalized performance rating (Rij) form a normalized matrix (R)
i) The final result of preference value (Vi) is obtained from the sum of the multiplications of normalized matrix row elements (R) with preference weights (W) corresponding to the matrix column elements (W) [10]

Formula for doing Normalization:

$$R_{ij} = \begin{cases} \dfrac{x_{ij}}{Max\ x_{ij}} & if\ j\ is\ the\ profit\ attribute (benefit) \\ \dfrac{i}{Min\ x_{ij}} & \\ \dfrac{i}{x_{ij}} & if\ j\ is\ the\ cost\ atribute\ (cost) \end{cases}$$

3. Research Method

The framework that will be carried out by researchers to find data and information that will help in establishing research is as follows.

a) Gathering Data Methods
This research data collection method is a questionnaire method with direct studies or surveys. This method uses some closed questions or statements with the answer choices provided.
b) Data Analysis Stage
Analyzing data using questionnaires conducted directly by guiding respondents who are Durian villagers, so it is expected that the results obtained will be more accurate and describe the condition and the population as a whole.

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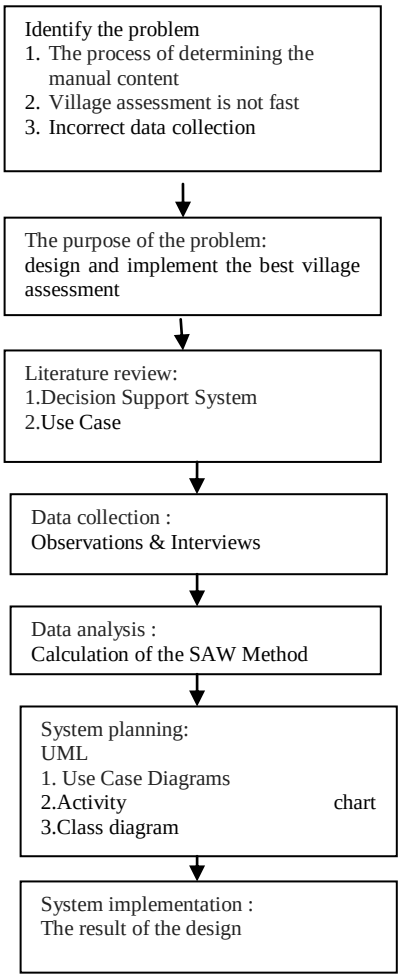

Figure 1.Research framework

4. Analysis

4.1 Settlement Algorithm

a) Determine the criteria

b) Provide a match rating value

Based on a case study in the village assessment at the sub-district office, an assessment of each criterion is obtained as follows

Table 1.
Village evaluation criteria

No.	Criteria Code	Criteria	Information	Weight Value
1.	C1	Implementation of village deliberations		0.1
2.	C2	community representatives	Field of government	0.1
3.	C3	village government representatives		0.05
4.	C4	village consultative body representation		0.05
5.	C5	Village boundary	The field of ownership	0.1
6.	C6	Boundary determination with ordinate		0.1
7.	C7	Society participation	Social Sector	0.1
8.	C8	The ratio of male and female		0.025

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No.	Criteria Code	Criteria	Information	Weight Value
9.	C9	Community funding participation		0.025
10.	C10	Participation in funding management by the community		0.05
11.	C11	Community cooperation activities		0.1
12.	C12	Youth organization activities		0.05
13.	C13	Professional organization activities		0.05
14.	C14	Sport Organization activities		0.05
15.	C15	LPM activity		0.05

Then from each criterion is given again for the sub-criteria value of each criterion, the following is the criteria data and the sub-criterion value for the best village assessment in the sub-district, namely:

Table 2.
Criteria and sub criteria values

Criteria	Criteria sub	Value
Implementation of village deliberations	There is no	1
	There is	2
community representatives	There is no	1
	There is	2
village government representatives	There is no	1
	There is	2
village consultative body representation	There is no	1
	There is	2
Village boundary	There is no	1
	There is	2
Boundary determination with ordinate	There is no	1
	There is	2
Society participation	There is no	1
	There is	5
The ratio of male and female	Not Balanced	1
	Balanced	3
Community funding participation	There is no	1
	There is	2
Participation in funding management by the community	There is no	1
	There is	2
Community cooperation activities	There is no	1
	There is	4
Youth organization activities	There is no	1
	There is	2
Professional organization activities	There is no	1
	There is	2
Sport Organization activities	There is no	1
	There is	2
LPM activity	There is no	1
	There is	2

c) Determine preference weights

he Decision maker has determined the weights or preference weights are as follows :
W= [0.1 0.1 0.05 0.05 0.1 0.1 0.1 0.025 0.025 0.05 0.1 0.05 0.05 0.05 0.05]

d) Make a match rating table of each alternative on each criterion

Table 3.
Match Rating

No.	Criteria	Alternative						
		A1	A2	A3	A4	A5	A6	A7
1.	C1	2	1	1	2	2	2	1
2.	C2	2	2	2	2	2	1	1
3.	C3	2	2	2	2	1	2	2
4.	C4	1	1	1	1	2	1	1

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No.	Criteria	Alternative						
		A1	A2	A3	A4	A5	A6	A7
5.	C5	2	1	1	2	2	1	2
6.	C6	2	2	2	2	2	1	2
7.	C7	5	1	5	5	5	5	5
8.	C8	1	1	1	1	1	3	3
9.	C9	1	1	2	2	2	2	1
10.	C10	1	2	1	1	1	2	2
11.	C11	1	4	4	1	1	4	4
12.	C12	1	2	1	1	2	2	1
13.	C13	2	1	1	1	1	1	2
14.	C14	1	2	2	2	2	2	2
15.	C15	2	1	1	1	1	2	2

e) The Decision matrix X

$$X=\begin{Bmatrix} 2 & 2 & 2 & 1 & 2 & 2 & 5 & 1 & 1 & 1 & 1 & 1 & 2 & 1 & 2 \\ 1 & 2 & 2 & 1 & 1 & 2 & 1 & 1 & 1 & 2 & 4 & 2 & 1 & 2 & 1 \\ 1 & 2 & 2 & 1 & 1 & 2 & 5 & 1 & 2 & 1 & 4 & 1 & 1 & 2 & 1 \\ 2 & 2 & 2 & 1 & 2 & 2 & 5 & 1 & 2 & 1 & 1 & 1 & 1 & 2 & 1 \\ 2 & 2 & 1 & 2 & 2 & 2 & 5 & 1 & 2 & 1 & 1 & 2 & 1 & 2 & 1 \\ 2 & 1 & 2 & 1 & 1 & 1 & 5 & 3 & 2 & 2 & 4 & 2 & 1 & 2 & 2 \\ 1 & 1 & 2 & 1 & 2 & 2 & 5 & 3 & 1 & 2 & 4 & 1 & 2 & 2 & 2 \end{Bmatrix}$$

f) Perform the normalization process

$$r_{11}=\frac{2}{\max\{2+1+1+2+2+2+1\}}=\frac{2}{2}=1 \qquad r_{41}=\frac{1}{\max\{1+1+1+1+2+1+1\}}=\frac{1}{2}=0.5$$

$$r_{21}=\frac{2}{\max\{2+2+2+2+2+1+1\}}=\frac{2}{2}=1 \qquad r_{51}=\frac{2}{\max\{2+1+1+2+2+1+2\}}=\frac{2}{2}=1$$

$$r_{31}=\frac{2}{\max\{2+2+2+2+1+2+2\}}=\frac{2}{2}=1 \qquad r_{61}=\frac{2}{\max\{2+2+2+2+2+1+2\}}=\frac{2}{2}=$$

$$1r_{71}=\frac{5}{\max\{5+1+5+5+5+5+5\}}=\frac{5}{5}=1$$

g) Normalized Result Matrix (R)

$$R=\begin{Bmatrix} 1 & 1 & 1\ 0.5 & 1 & 1\ 1 & 0.333 & 1 & 1 & 0.25 & 0.5\ 1 & 0.5 & 1 & 0.5 \\ 0.5 & 1 & 1\ 0.5 & 0.5 & 10.2 & 0.333 & 1\ 0.5 & 1 & 0.5 & 1 & 0.5 \\ 0.5 & 1 & 1\ 0.5 & 0.5 & 1\ 1 & 0.333 & 0.5 & 1 & 1 & 0.5\ 0.5 & 1 & 0.5 \\ 1 & 1 & 1\ 0.5 & 1 & 1\ 1 & 0.333 & 0.5 & 1 & 0.25 & 0.5\ 0.5 & 1 & 0.5 \\ 1 & 1 & 0.5\ 1 & 1 & 1\ 1 & 0.333 & 0.5 & 1 & 0.25 & 1 & 0.5 & 1 & 0.5 \\ 1 & 0.5 & 1\ 0.5 & 0.5 & 0.51 & 1 & 0.5\ 0.5 & 1 & 1 & 0.5 & 1 & 1 \\ 0.5\ 0.5 & 0.5 & 10.5 & 1 & 11 & 1 & 1 & 0.5 & 1 & 0.5 & 1 & 1 & 1 \end{Bmatrix}$$

h) Look For the best alternative preference values

V_1 =(0.1*1)+(0.1*1)+(0.05*1)+(0.05*0.5)+(0.1*1)+(0.1*1)+(0.1*1)+(0.025*0.333)+(0.025*0.5)+(0.05*0.5)+(0.1*0.25)+(0.05*0.5)+(0.05*1)+(0.05*0.5)+(0.05*1)
=0.833325

V_2 =(0.1*0.5) + (0.1*1) + (0.05*1) + (0.05*0.5) + (0.1*0.5) + (0.1*1) + (0.1*0.2) + (0.025*0.333) + (0.025*0.5) + (0.05*1) + (0.1*1) + (0.05*1) + (0.05*0.5) + (0.05*1) + (0.05*0.5)
=0.703325

V_3 =(0.1*0.5) + (0.1*1) + (0.05*1) + (0.05*0.5) + (0.1*0.5) + (0.1*1) + (0.1*1) + (0.025*0.333) + (0.025*1) + (0.05*0.5) + (0.1*1) + (0.05*0.5) + (0.05*0.5) + (0.05*1) + (0.05*0.5)
=0.770825

V_4=(0.1*1) + (0.1*1) + (0.05*1) + (0.05*0.5) + (0.1*1) + (0.1*1) + (0.1*1) + (0.025*0.333) + (0.025*1) +

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(0.05*0.5) + (0.1*0.25) + (0.05*0.5) + (0.05*0.5) + (0.05*1) + (0.05*0.5)
=0.795825

i) Ranking Table

Table 4.
Ranking result

Alternative	Village Name	Value SAW	Information
A1	Adolina	0.833325	Best
A2	Melati II	0.703325	Well
A3	TanjungBuluh	0.770825	Well
A4	SeiBuluh	0.795825	Well
A5	SeiSijenggi	0.820825	Best
A6	Deli MudaHulu	0.7625	Well
A7	CitamanJernih	0.825	Best

j) System Planning

Use case Diagram

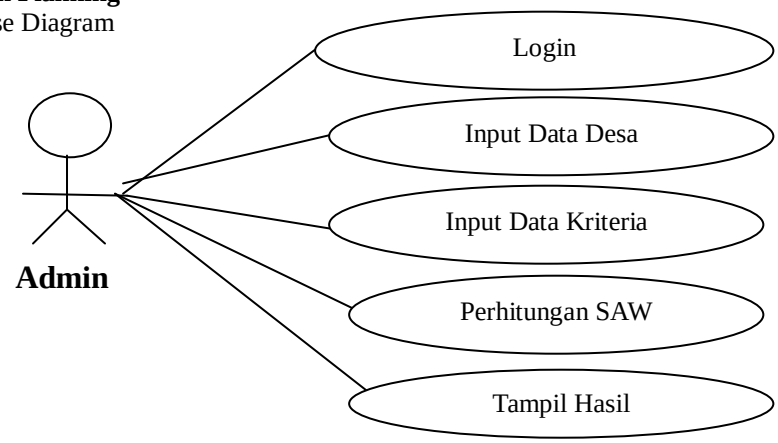

Figure 2. Use Case Diagram

5. Conclusion

a) In designing the application of the best village appraisal decision support system using the SAW method, first, we determine the criteria first, then know the village data that will be used as an object in the best village appraisal, then carry out the appraisal process and finally calculate the existing village data .

b) The system that has been designed is then implemented by entering data in accordance with that in the previous chapters, then if the output results match the manual data then in this test the system runs well, adding data to the database, an update command to change data in the database, delete command to delete data in the database.

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