APPLICATION OF THE SMART METHOD TO DETERMINE THE BEST VILLAGE

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Keywords:
decision support system;
smart;
village.

ABSTRACT

In the national mid-term development plan, the Asahan government holds activities that are carried out annually by providing the best village assessment. From this method, the government can increase development, improve the quality of life and welfare of society. The number of villages that became members of the competition became a difficulty in the assessment process. So that there are often mistakes and mistakes in the implementation of village assessments that are not transparent in a transparent manner by the Community and Village Empowerment Service. Because many criteria are used, it adds to the errors in the assessment. There are 5 criteria used in the assessment, namely viewed from the field of government, type of document, the field of society, the field of village administration, the area of territory, and the achievements of the village. This study aims to help provide a decision using the DSS SMART Method by giving weight to each criterion and as a ranking for each village alternative. The data obtained and used is village data in Asahan district. The result of a decision is taken from the highest score on the village alternative that has been determined in the system. One solution to assist the assessment team in the calculation process in assessing each village is to use a decision support system using the Simple Multi-Attribute Rating Technique (SMART) method.

INTRODUCTION

Empowerment of village communities needs to be carried out by strengthening institutions, increasing motivation, and self-help community cooperation in the village. So that in order to assess the success of village development it is necessary to conduct a directed, coordinated, integrated, and sustainable competition. In the national mid-term development plan, it is necessary to carry out activities to carry out the best village assessment as a way for the government to increase development, increase the quality of life and the welfare of village communities[1].

Competition assessment is carried out by comparing the level of recent developments based on village or subdistrict profile data according to the assessment

criteria. The best village assessment conducted by the Asahan District Community and Village Empowerment Agency (PMD) uses 5 criteria in its assessment. These criteria are seen from the field of government, the type of document, the field of society, the field of village administration, the area of territory, and the achievements of the village.

The best village assessment implementation activities must be carried out quickly, openly, and competitively even though the amount of data entered is relatively large but the accuracy of calculations and reports can be achieved as much as possible and time efficiency in the completion of a report must be better. before it was carried out based on the results of the assessment and ranking at the village level. After that, the best village assessment was conducted again at the sub-district level. The winner of the best village assessment at the village level and at the sub-district level was invited back to take part in the best village competition in the Asahan district. Each from each sub-district represents several villages that can participate in the competition.

This activity was previously carried out in the process of calculating the assessment manually, so mistakes often occur in the implementation and determination of village assessments that are not transparent. Due to the large number of criteria, the assessment team will find it increasingly difficult to make assessments, so that mistakes often occur in decision making. Based on these problems, the Office of Community and Village Empowerment (PMD) needs to make changes with a computerized system, so that the information processing and decision support systems become more accurate. This is a reason for researchers to conduct research in determining the best villages in Asahan district. Therefore, by taking advantage of technological advances, a support system is needed to provide recommendations for determining the best village in the Asahan district, based on predetermined criteria[2].

Many branches of computer science today can be used to solve complex problems. One of them is a Decision Support System (DSS) or Decision Support System (DSS). This branch of knowledge has the advantage of solving a variety of different cases[3]. Researchers use the DSS branch of science in solving these cases. Given that DSS is a branch of science that can solve ranking problems.

Decision support systems are systems that can help solve problems and provide information and predict information users to make better decisions[4]. This problem can be fixed by building a decision support system to determine the best village using the SMART (Simple Multi-Attribute Rating Technique) method.

The SMART method is often used because of its simplicity in responding to the needs of decision-makers and analyzing responses. The analysis is best transparent so that this method provides a high level of understanding of the problem and is acceptable to the decision-maker. The weighting on SMART uses a scale of 0 to 1, making it easier to calculate and compare the value of each alternative [5].

SMART (Simple Multi-Attribute Rating Technique) is a multicriteria decision-making method developed by Edward in 1997. This multicriteria decision-making technique is based on the theory that each alternative consists of a number of criteria that have values and each criterion has a weight that describes how important it is compared to other criteria. This weighting is used to assess each alternative in order to obtain the best alternative [6],[7].

METHOD

The Simple Multi-Attribute Rating Technique method is a method for multi-criteria decision making that was developed in 1997 by Edward. The SMART method is based on the theory that each alternative consists of a number of criteria that have a value and each criterion have a weight that describes how important the value of the weight is compared to other criteria.

The steps for completing the SMART method, in general, are as follows[8]:
1. Determine the problem
2. Determine the criteria that will be used
3. Determine the alternatives to be used
4. Give weight to each criterion for each alternative

$$Wij = \frac{Cout - Cmin}{Cmax - Cmin} \qquad (1)$$

Where :
Wij　　= the weight of the criterion in row i column j
Cout　 = record value
Cmin　= minimum value on criterion to x
Cmax　= maximum value on criterion to x

5. Calculate the normalized value for each criterion in each alternative

$$Normalisasi = \frac{Wij}{\sum Wij} \qquad (2)$$

6. Hitung nilai utilities pada setiap alternative

$$u_i(a_i) = 100 \frac{(C_{max} - C_{outi})}{(C_{max} - C_{min})} \qquad (3)$$

Where :
u(ai)　 = the utility value of the ith criterion for the ith criterion

In this research, 17 villages will be used as alternatives, namely P01 = Aek Bange, P02 = Aek Korsik, P03 = Ledong Timur, P04 = Silo Bonto, P05 = Silo Lama, P06 = Buntu Pane, P07 = Karya Ambalutu, P08 = Mekar Sari, P09 = Tanjung Asri, P10 = Sei Silau Barat, P11 = Bangun Sari, P12 = Silau Maraja, P13 = Rawang Pasar VI, P14 = Rawang Pasar V, P15 = Pondok Bungur, P16 = Bp. Mandoge, P17 = Silau Jawa.
5 criteria will be used as a reference in making decisions:
C1 = Governmental field document type
C2 = Social Affairs
C3 = Village Administration Sector
C4 = Territorial field
C5 = Village Achievements

RESULT AND DISCUSSION

In this study, in determining the best village in Asahan district, several alternative data were used which were the objects examined in the study. the sample data used amounted to 17 districts.

Tables 1. Alternative

No.	Alternative
1.	Aek Bange
2.	Aek Korsik
3.	Ledong Timur
4.	Silo Bonto
5.	Silo Lama
6.	Buntu Pane
7.	Karya Ambalutu
8.	Mekar Sari
9.	Tanjung Asri
10.	Sei Silau Barat
11.	Bangun Sari
12.	Silau Maraja
13.	Rawang Pasar VI
14.	Rawang Pasar V
15.	Pondok Bungur
16.	Bp. Mandoge
17.	Silau Jawa

As for the number of criteria Based on data from interviews with the Office of Community and Village Empowerment (PMD), the criteria that became the point of assessment were 5 criteria.

Tables 2. Criteria

Criteria Code	Criteria Name
K1	Governmental field document type
K2	Social Affairs
K3	Village Administration Sector
K4	Territorial field
K5	Village Achievements

Furthermore, giving the weight normalization priority scale is carried out to determine preferences for each criterion.

Tables 3. Criteria and Weight

Criteria Code	Criteria Name	Weight
K1	Governmental field document type	30
K2	Social Affairs	25
K3	Village Administration Sector	20
K4	Territorial field	15
K5	Village Achievements	10
	amount	100

Furthermore, the weight normalization is carried out using a formula

$$Ni = \frac{Wi}{\sum Wi}$$

Tables 4. Normalized Criteria Weight Value

Criteria Code	Criteria Name	Weight	Normalized Value
K1	Governmental field document type	30	30/100=0.30
K2	Social Affairs	25	25/100=0.25
K3	Village Administration Sector	20	20/100=0.20
K4	Territorial field	15	15/100=0.15
K5	Village Achievements	10	10/100=0.10
	amount	100	

After that determine the value of the Alternative. The author gets an alternative score based on the criteria of interviews with the Office of Community and Village Empowerment (PMD).

Tables 5. Alternative

No.	Alternative	K1	K2	K3	K4	K5
1.	Aek Bange	80	83	70	71	65
2.	Aek Korsik	50	80	80	40	30
3.	Ledong Timur	60	70	34	69	88
4.	Silo Bonto	81	81	38	38	33
5.	Silo Lama	70	25	24	70	78
6.	Buntu Pane	82	86	67	70	88
7.	Karya Ambalutu	79	79	66	80	73
8.	Mekar Sari	65	66	40	70	75
9.	Tanjung Asri	77	30	32	75	77
10.	Sei Silau Barat	50	87	31	40	35

Tables 5. Alternative

No.	Alternative	K1	K2	K3	K4	K5
11.	Bangun Sari	87	26	27	79	77
12.	Silau Maraja	90	89	40	87	33
13.	Rawang Pasar VI	90	93	89	88	79
14.	Rawang Pasar V	88	81	77	78	35
15.	Pondok Bungur	77	76	34	79	20
16.	Bp. Mandoge	65	65	65	70	22
17.	Silau Jawa	79	40	40	91	75
11.	Bangun Sari	87	26	27	79	77

Tables 6. Calculate the final grade

Alternative	Criteria Code	Value of Utility	Normalization	Score
Aek Bange	K1	1.00	0.30	0.78
	K2	1.00	0.25	
	K3	0.50	0.20	
	K4	0.50	0.15	
	K5	0.50	0.10	
Aek Korsik	K1	0.50	0.30	0.50
	K2	1.00	0.25	
	K3	0.50	0.20	
	K4	0.00	0.15	
	K5	0.00	0.10	
Bangun Sari	K1	1.00	0.30	0.43
	K2	0.00	0.25	
	K3	0.00	0.20	
	K4	0.50	0.15	
	K5	0.50	0.10	
Bp. Mandoge	K1	0.50	0.30	0.45
	K2	0.50	0.25	
	K3	0.50	0.20	
	K4	0.50	0.15	
	K5	0.00	0.10	
Buntu Pane	K1	1.00	0.30	0.83
	K2	1.00	0.25	
	K3	0.50	0.20	
	K4	0.50	0.15	
	K5	1.00	0.10	

Tables 6. Calculate the final grade

Alternatif	Kriteria	Nilai Utility	Normalisasi	Skor
Karya Ambalutu	K1	0.50	0.30	0.58
	K2	0.50	0.25	
	K3	0.50	0.20	
	K4	1.00	0.15	
	K5	0.50	0.10	
Ledong Timur	K1	0.50	0.30	0.45
	K2	0.50	0.25	
	K3	0.00	0.20	
	K4	0.50	0.15	
	K5	1.00	0.10	
Mekar Sari	K1	0.50	0.30	0.40
	K2	0.50	0.25	
	K3	0.00	0.20	
	K4	0.50	0.15	
	K5	0.50	0.10	
Pondok Bungur	K1	0.50	0.30	0.35
	K2	0.50	0.25	
	K3	0.00	0.20	
	K4	0.50	0.15	
	K5	0.00	0.10	
Rawang Pasar V	K1	1.00	0.30	0.74
	K2	1.00	0.25	
	K3	0.50	0.20	
	K4	0.50	0.15	
	K5	0.00	0.10	
Rawang Pasar VI	K1	1.00	0.30	0.95
	K2	1.00	0.25	
	K3	1.00	0.20	
	K4	1.00	0.15	
	K5	0.50	0.10	
Sei Silau Barat	K1	0.50	0.30	0.40
	K2	1.00	0.25	
	K3	0.00	0.20	
	K4	0.00	0.15	
	K5	0.00	0.10	

Tables 6. Calculate the final grade

Alternative	Criteria Code	Value of Utility	Normalization	Score
Silau Jawa	K1	0.50	0.30	0.35
	K2	0.00	0.25	
	K3	0.00	0.20	
	K4	1,00	0.15	
	K5	0.50	0.10	
Silau Maraja	K1	1.00	0.30	0.70
	K2	1.00	0.25	
	K3	0.00	0.20	
	K4	1.00	0.15	
	K5	0.00	0.10	
Silo Bonto	K1	1.00	0.30	0.55
	K2	1.00	0.25	
	K3	0.00	0.20	
	K4	0.00	0.15	
	K5	0.00	0.10	
Silo Lama	K1	0.50	0.30	0.40
	K2	0.00	0.25	
	K3	0.00	0.20	
	K4	1.00	0.15	
	K5	1.00	0.10	
Tanjung Asri	K1	0.50	0.30	0.28
	K2	0.00	0.25	
	K3	0.00	0.20	
	K4	0.50	0.15	
	K5	0.50	0.10	

Tables 7. Rating

No.	Alternative	Score	Rating
1	Rawang Pasar VI	0.95	1
2	Buntu Pane	0.83	2
3	Aek Bange	0.78	3
4	Rawang Pasar V	0.73	4
5	Silau Maraja	0.70	5
6	Karya Ambalutu	0.58	6
7	Silo Bonto	0.55	7
8	Aek Korsik	0.50	8

Tables 7. Rating

No.	Alternative	Score	Rating
9	Ledong Timur	0.45	9
10	Bp. Mandoge	0.45	10
11	Bangun Sari	0.43	11
12	Silo Lama	0.40	12
13	Mekar Sari	0.40	13
14	Sei Silau Barat	0.40	14
15	Pondok Bungur	0.35	15
16	Silau Jawa	0.35	16
17	Tanjung Asri	0.28	17

The Community and Village Empowerment Office only chose the best 3 villages in the best village assessment. It can be seen from table 7 that the village of Rawang Pasar VI is in 1st place with the highest score of 0.95. Buntu Pane Village was ranked 2 with a score of 0.83. Meanwhile, for the 3rd winner, Aek Bange was awarded a score of 0.78.

CONCLUSION

The SMART method can assist the assessment team in providing a transparent assessment of each village, and is very effective in determining the best village in Asahan district. The results of data testing consisted of 17 villages that produced the system output, namely the village of Rawang Pasar VI with the highest score which was in the main rank so that it had relevant results in decision making.

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