Journal of Artificial Intelligence and Engineering Applications

Website: https://ioinformatic.org/

15th February 2023. Vol. 2. No. 2

A Decision Support System To Determine The Location Of A New Sales Branch At Star East Shop With The Smart Method

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Abstract

In a business world that is always dynamic and full of competition, business people must always think of ways to continue to survive and if possible develop their business scale in order to meet these business needs, there are many ways that can be taken, one of which is by conducting data analysis. . Bintang Timur shop is one of the businesses in the field of iron and building material shops in the city of stabat. Bintang Timur shop was founded in 2013 which continues to grow at this time. Equipped with the desire to meet the needs of users in the field of iron and building, Bintang Timur store continues to grow by adding various products. The profits obtained in this shop are also used to develop the business, one of which is the addition of goods sold. Based on the analysis that has been done, there are several obstacles faced by this eastern star shop. One of them is the process of finding a new sales branch location at the Bintang Timur store. In this study, a Decision Support System (DSS) will be built using the Simple Multiple Attribute Rating Technique (SMART) method which is a multi-criteria decision making technique based on each alternative consisting of of a number of criteria that have a value and each criterion. Based on the calculation results of the SMART method above, Tebasan (A1) is a new branch location at the Bintang Timur Store in Stabat City which is feasible with a value of 0.763.

Keywords: Location_Branch, Decision Support System, SMART.

1. Introduction

In a business world that is always dynamic and full of competition, business people must always think of ways to continue to survive and if possible develop their business scale in order to meet these business needs.

Bintang Timur shop is one of the businesses in the field of iron and building material shops in the city of stabat. Bintang Timur shop was founded in 2013 which continues to grow at this time. Equipped with the desire to meet the needs of users in the field of iron and building, Bintang Timur store continues to grow by adding various products. The profits obtained in this shop are also used to develop the business, one of which is the addition of goods sold.

Based on the analysis that has been done, there are several obstacles faced by this eastern star shop. One of them is the process of finding a new sales branch location at the Bintang Timur store. Besides that, in a location it has its own advantages and disadvantages, so it is difficult for shop owners to determine which locations are appropriate for the information system that the author created can reduce some of the risk of complaints to existing customers.

at the eastern star shop. Such as the achievement of delivery of goods that will be faster to a predetermined destination. With the system, it is expected to increase progress in work because of the conveniences that have been provided.

Of the many available locations, each of them has different criteria and advantages and the criteria for excellence are taken into consideration when determining the location of sales at Bintang Timur stores. According to a research journal conducted by Zainul Hakim Hilmi 2013. Fuat, Novia Nabilah Nurkam Store Location Decision Support System Using the Analytical Hierarchy Process Method (Case Study: at PT Sumber Indah Lestari). Thus, the selection of one of the others can be an alternative solution in supporting the assessment to determine the location of a new sales branch and is also expected to be further developed in the future.

2. Research Methodology

2.1. Decision Support System

Decision Support System (DSS) or Decision Support System (DSS) is a system that is able to provide problem solving skills and communication skills for problems with semi-structured and unstructured conditions. This system is used to assist decision making in semi-structured and unstructured situations. structured, where no one knows for sure how decisions should be made. DSS aims to provide

information, guide, predict and direct information users to make better decisions.

According to Alter (Kusrini, 2007, p.15), a decision support system is an interactive information system that provides information, modeling and manipulating data. This system is used to assist decision making in semi-structured and unstructured situations, where no one know exactly how decisions should be made.

2.2. Simple Multi Attribute Rating Technique (SMART)

SMART (Simple Multi Attribute Rating Technique) is a multi-criteria decision-making method developed by Edward in 1977. This multi-criteria 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.

The linear utility function model used by SMART is as follows:

Maximize=∑_(J^1)^K⟦w_j,u_ij,∀i =1,…..n ……(2.1)

Where :

a) w_(j)is the weighting value of the jth criterion of k criteria
b) u_ij is alternative utility value i on criterion j
c) Decision selection is to identify which of the n alternatives has the largest function value.
d) The value of this function can also be used to rank alternatives

3. Research Result

In designing a decision support system to determine the location of the new sales branch at the Bintang Timur Store, there are three assessments that are used as criteria and the weight values for each of the existing criteria are in the table below:

Table 1 : Assesment Critieria

Criteria	Description	Weight(Wj)
C1	Region	30
C2	Distance	50
C3	Supporting Facilities	20
Total Weight ($\sum Wj$)		100

The following is an assessment of each of the existing criteria:

1. Region criteria assessment

Table 2 : Region Critieria

Region Criteria	**Keterangan**	**Nilai**
South	Very Good	4
West	Good	3
North	Enough	2
East	Not Enough	1

2. Distance Criteria Assesment

Table 3 : Distance Critieria

Distance	**Description**	**Score**
1- 4 km – dari Toko Bintang Timur	Not Enough	1
5 -6 km – dari Toko Bintang Timur	Eough	2
7-9 km – dari Toko Bintang Timur	Good	3
10-13 km – dari Toko Bintang Timur	Very Good	4

3. Assessment Criteria For Supporting Facilities

Table 4 : Supporting Facilities Critieria

Means	**Description**	**Score**
Security	Very Good	4
Location	Good	3
Pacilities	Enough	2
Lighting	Not Enough	1

4. Weight Normalization

The weight value on the predetermined criteria from the highest to the lowest will be normalized by weight normalization by dividing the criterion weight (Wj) by the total weight of the weight ($\sum Wj$). Normalization of the weights on the existing criteria as follows:

$W_1 = \frac{30}{100} = 0{,}3$

$W_2 = \frac{50}{100} = 0{,}5$

$W_3 = \frac{20}{100} = 0{,}2$

Table 5 : Weight Normalization

Criteria	**Descipriton**	**Weight (Wj)**	**Weight Normalization**
C1	Distance	30	0,3
C2	Region	50	0,5
C3	Supporting Facilites	20	0,2

5. Data for Determining the Location of New Branches at Bintang Timur Stores

Table 6 : Data for Determining the Location

No	Location	Criteria	
		Region	**Distance**
1	Jl. Tebasan Ds IB Stabat	Selatan	7km dari Toko
2	Jl. Kruni Dsn. IV Stabat	Barat	10km dari Toko
3	Desa Pantai Gemi. Dsn III Stabat	Utara	1 km dari Toko
4	Jl. Ampera Dsn V. Stabat	Timur	5 km dari Toko
5	Desa Pantai Luas. Stabat	Barat	7 km dari Toko
6	Kampung Nangka. Dsn II Secanggang	Timur	1 km dari Toko
7	Desa Pondok Merpati Secanggang	Utara	Keamanan
8	Desa Gohor Lama Dsn I Stabat	Barat	5 km dari Toko
9	Jl.Suka Mulia Dsn II Secanggang	Selatan	7 km dari Toko
10	Jl.Tanjung Beringin Pasar 4,5. Kec. Tanjung Pura	Timur	1 km dari Toko

6. New Branch Location Determination Data at Bintang Timur Store

Table 7 : New Branch Location Data Based on Criteria

No	Location	Criteria		
		Region	**Distance**	**Supporting Facilities**
1	Jl. Tebasan Ds IB Stabat	Sangat Baik	Baik	Sangat Baik
2	Jl. Kruni Dsn. IV Stabat	Baik	Sangat Baik	Cukup
3	Desa Pantai Gemi. Dsn III Stabat	Cukup	Kurang	Kurang
4	Jl. Ampera Dsn V. Stabat	Kurang	Cukup	Sangat Baik
5	Desa Pantai Luas. Stabat	Baik	Baik	Kurang
6	Kampung Nangka. Dsn II Secanggang	Kurang	Kurang	Baik
7	Desa Pondok Merpati Secanggang	Cukup	Baik	Sangat Baik
8	Desa Gohor Lama. Dsn I Stabat	Baik	Cukup	Kurang
9	Jl.Suka Mulia Dsn II Secanggang	Sangat Baik	Baik	Kurang
10	Jl.Tanjung Beringin Pasar 4.5. Kec. Tanjung Pura	Kurang	Kurang	Sangat Baik

7. Giving Criteria Value For Each Alternative

The next stage gives value to each alternative, which is as follows:

Table 8 : Giving Criteria Value For Each Alternative

No	Location	C1	C2	C3
1	Tebasan	4	3	3
2	Kruni	3	4	2
3	Pantai Gemi	2	1	1
4	Ampera	1	2	4
5	Pantai Luas	3	3	1
6	Kampung Nangka	1	1	3
7	Pondok Merpati	2	3	4
8	Gohor Lama	3	2	1
9	Suka Mulia	4	3	1
10	Tanjung Beringin	1	1	4

8. Calculating Utility Value

Table 9 : Ulitity Value

No	Alternative	Criteria	Utility Vales
1	A1	C1	1
		C2	0,66
		C3	0,66
2	A2	C1	0,66
		C2	0
		C3	0,33
3	A3	C1	0,33
		C2	0
		C3	0
4	A4	C1	0
		C2	0,33
		C3	1
5	A5	C1	0,66
		C2	0,66
		C3	0
6	A6	C1	0
		C2	0

No	Alternative	Criteria	Utility Vales
		C3	0,66
7	A7	C1	0,33
		C2	0,66
		C3	0
8	A8	C1	0,66
		C2	0,33
		C3	0
9	A9	C1	1
		C2	0,66
		C3	0
10	A10	C1	0
		C2	0
		C3	1

9. Calculate Final Values

The next step is to calculate the final value with the formula $u(\alpha_i) = \sum_{j=1}^{m} wj.ui\ (\alpha i)$

Alternatif A_1

A_1 (C_1) = 1 x 0,3 = 0,3

A_1 (C_2) = 0,66 x 0,5 = 0,33

A_1 (C_3) = 0,66 x 0,2 = 0,132

A_1 (Total) = 0,3 + 0,33 + 0,132 = 0,763

Alternatif A_2

A_2 (C_1) = 0,66 x 0,3 = 0,198

A_2(C_2) = 0 x 0,5 = 0

A_2 (C_3) = 0,33 x 0,2 = 0,066

A_2(Total) = 0,198 + 0 + 0,066 = 0,264

Alternatif A_3

A_3 (C_1) = 0,33 x 0,3 = 0,099

A_3 (C_2) = 0 x 0,5 = 0

A_3 (C_3) = 0 x 0,2 = 0

A_3 (Total) = 0,099 + 0 + 0 = 0,099

Alternatif A_4

A_4 (C_1) = 0 x 0,3 = 0

A_4 (C_2) = 0,33 x 0,5 = 0,165

A_4 (C_3) = 1 x 0,2 = 0,2

A_4(Total) = 0 + 0,165 + 0,2 = 0,365

Alternatif A_5

A_5 (C_1) = 0,66 x 0,3 = 0,198

A_5 (C_2) = 0,66 x 0,5 = 0,33

A_5 (C_3) = 0 x 0,2 = 0

A_5 (Total) = 0,198 + 0,33 + 0 = 0,528

Alternatif A_6

A_6 (C_1) = 0 x 0,3 = 0

A_6 (C_2) = 0 x 0,5 = 0

A_6 (C_3) = 0,66 x 0,2 = 0,132

A_6 (Total) = 0 + 0 + 0,132 = 0,132

Alternatif A_7

A_7 (C_1) = 0,33 x 0,3 = 0,099

A_7 (C_2) = 0,66 x 0,5 = 0,33

A_7 (C_3) = 0 x 0,2 = 0

A_7 (Total) = 0,099 + 0,33 + 0 = 0,429

Alternatif A_8

A_8 (C_1) = 0,66 x 0,3 = 0,198

A_8 (C_2) = 0,33 x 0,5 = 0,165

A_8 (C_3) = 0 x 0,2 = 0

A_8 (Total) = 0,198 + 0,165 + 0 = 0,363

Alternatif A_9

A_9 (C_1) = 1 x 0,3 = 0,3
A_9 (C_2) = 0,66 x 0,5 = 0,33
A_9 (C_3) = 0 x 0,2 = 0

A_9 (Total) = 0,3 + 0,33 + 0 = 0,63

Alternatif A_{10}
A_{10} (C_1) = 0 x 0,3 = 0
A_{10} (C_2) = 0 x 0,5 = 0
A_{10} (C_3) = 1 x 0,2 = 0,2

A_{10} (Total) = 0 + 0 + 0,2 = 0,2

Table 10 : Final Value

No	Alternative	Final Values
1	A1	0,763
2	A2	0,264
3	A3	0,099
4	A4	0,365
5	A5	0,528
6	A6	0,132
7	A7	0,429
8	A8	0,363
9	A9	0,63
10	A10	0,2

Table 11 : Rangking

Alternative		Result	Rangking
A1	Tebasan	0,763	1
A9	Suka Mulia	0,63	2
A5	Pantai Luas	0,528	3
A7	Pondok Merpati	0,429	4
A4	Ampera	0,365	5
A8	Gohor Lama	0,363	6
A2	Kruni	0,264	7
A10	Tanjung Beringin	0,2	8
A6	Kampung Nangka	0,132	9
A3	Pantai Gemi	0,099	10

Based on the calculation results of the SMART method above, Tebasan (A1) is a new branch location at the Bintang Timur Store in Stabat City which is feasible with a value of 0.763.

4. Implementation

1. Login Form

Fig 1 : Login Form

2. Main Form / Home

Fig 2 : Home Form Display

3. SMART Method Decission Process Page Display

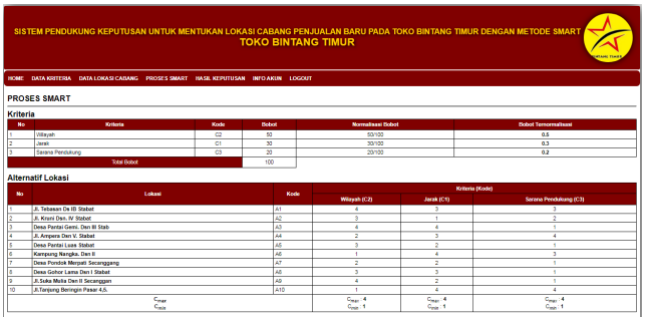


Fig 3 : SMART Method Decision Process Page Display

4. SMART Method Result Results Page Display

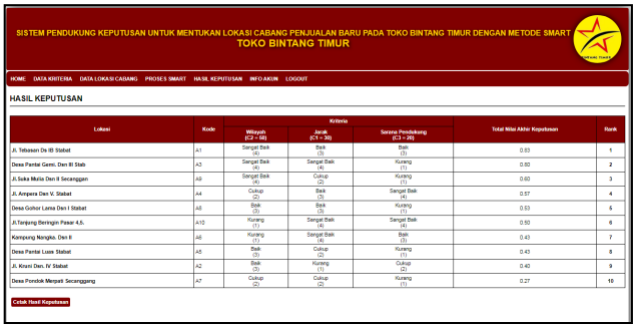
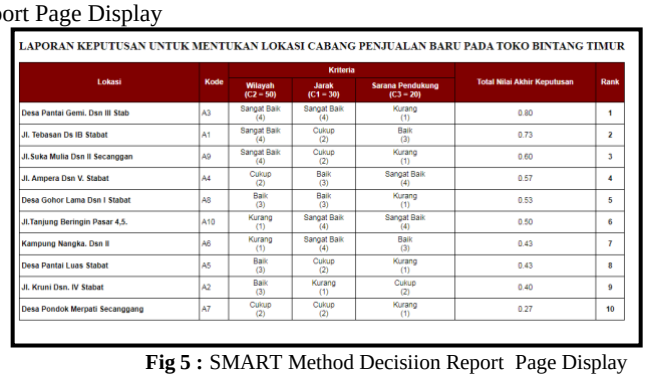


Fig 4 : SMART Method Result Results Page Display

5. SMART Method Decision Report Page Display



LAPORAN KEPUTUSAN UNTUK MENTUKAN LOKASI CABANG PENJUALAN BARU PADA TOKO BINTANG TIMUR

Lokasi	Kode	Kriteria			Total Nilai Akhir Keputusan	Rank
		Wilayah (C2 = 50)	Jarak (C1 = 30)	Sarana Pendukung (C3 = 20)		
Desa Pantai Gemi. Dsn III Stab	A3	Sangat Baik (4)	Sangat Baik (4)	Kurang (1)	0.80	1
Jl. Tebasan Ds IB Stabat	A1	Sangat Baik (4)	Cukup (2)	Baik (3)	0.73	2
Jl.Suka Mulia Dsn II Secanggan	A9	Sangat Baik (4)	Cukup (2)	Kurang (1)	0.60	3
Jl. Ampera Dsn V. Stabat	A4	Cukup (2)	Baik (3)	Sangat Baik (4)	0.57	4
Desa Gohor Lama Dsn I Stabat	A8	Baik (3)	Baik (3)	Kurang (1)	0.53	5
Jl.Tanjung Beringin Pasar 4,5.	A10	Kurang (1)	Sangat Baik (4)	Sangat Baik (4)	0.50	6
Kampung Nangka. Dsn II	A6	Kurang (1)	Sangat Baik (4)	Baik (3)	0.43	7
Desa Pantai Luas Stabat	A5	Baik (3)	Cukup (2)	Kurang (1)	0.43	8
Jl. Kruni Dsn. IV Stabat	A2	Baik (3)	Kurang (1)	Cukup (2)	0.40	9
Desa Pondok Merpati Secanggang	A7	Cukup (2)	Cukup (2)	Kurang (1)	0.27	10

Fig 5 : SMART Method Decisiion Report Page Display

6. Conclusion

After discussing and describing the previous chapters, the author provides several conclusions. The following are the conclusions that the author wrote in this study related to the decision support system to determine the location of the new sales branch at the Bintang Timur store using the SMART (Simple Multi Attribute Rating Technique) method, namely:

1. Testing the SMART (Simple Multi Attribute Rating Technique) method for the decision support system to determine the location of the sales branch in the store using 10 alternative data as analysis, and succeeded in determining A1 with a total final result of 0.763; it can be stated that A1 is a feasible location from the 10 alternative location data analyzed. System design is done to make it easier for users to use the system.

2. The best selling new branch location at Bintang Timur store is (A1) Jl. Stabat Dsn IB slash with total result; final 0.763
3. The results of testing on a system that has been built using the PHP programming language with a MySQL database have succeeded in determining the location of the branch at the A1 store as the location data that has been selected.

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